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NATIONAL WATER RESEARCH INSTITUTE

DIRECTORY OF STUDY PLANS
1982 - 83

INLAND WATERS DIRECTORATE

NATIONAL WATER RESEARCH INSTITUTE

DIRECTORY OF STUDY PLANS

1982-1983

NATIONAL WATER RESEARCH INSTITUTE
CANADA CENTRE FOR INLAND WATERS
P.O. BOX 5050
BURLINGTON, ONTARIO
L7R 4A6

JUNE 1982

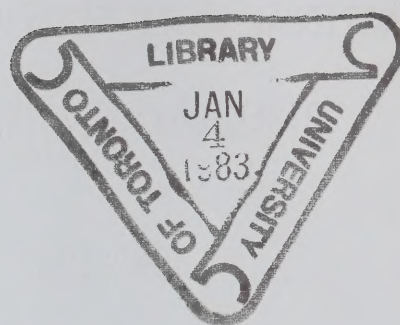


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Branch

Research

Pacific & Yukon Region

Western & Northern Region

World Health Organization Collaborating Centre

Environmental Contaminants Division (2)

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INTRODUCTION

DIRECTORY OF STUDY PLANS 1982-1983

The National Water Research Institute

This Directory provides the fifth annual indexed catalogue of planned research, development, engineering, scientific service and support service projects of the National Water Research Institute of the Inland Waters Directorate, Environmental Conservation Service, Department of the Environment, for the Fiscal Year 1982-1983.

This report is an internal document developed for operational purposes.

Programs internally are represented by the Divisional structure, designed to meet management requirements and Directorate program thrusts.

The relation amongst the management units is illustrated in the chart on the following page.

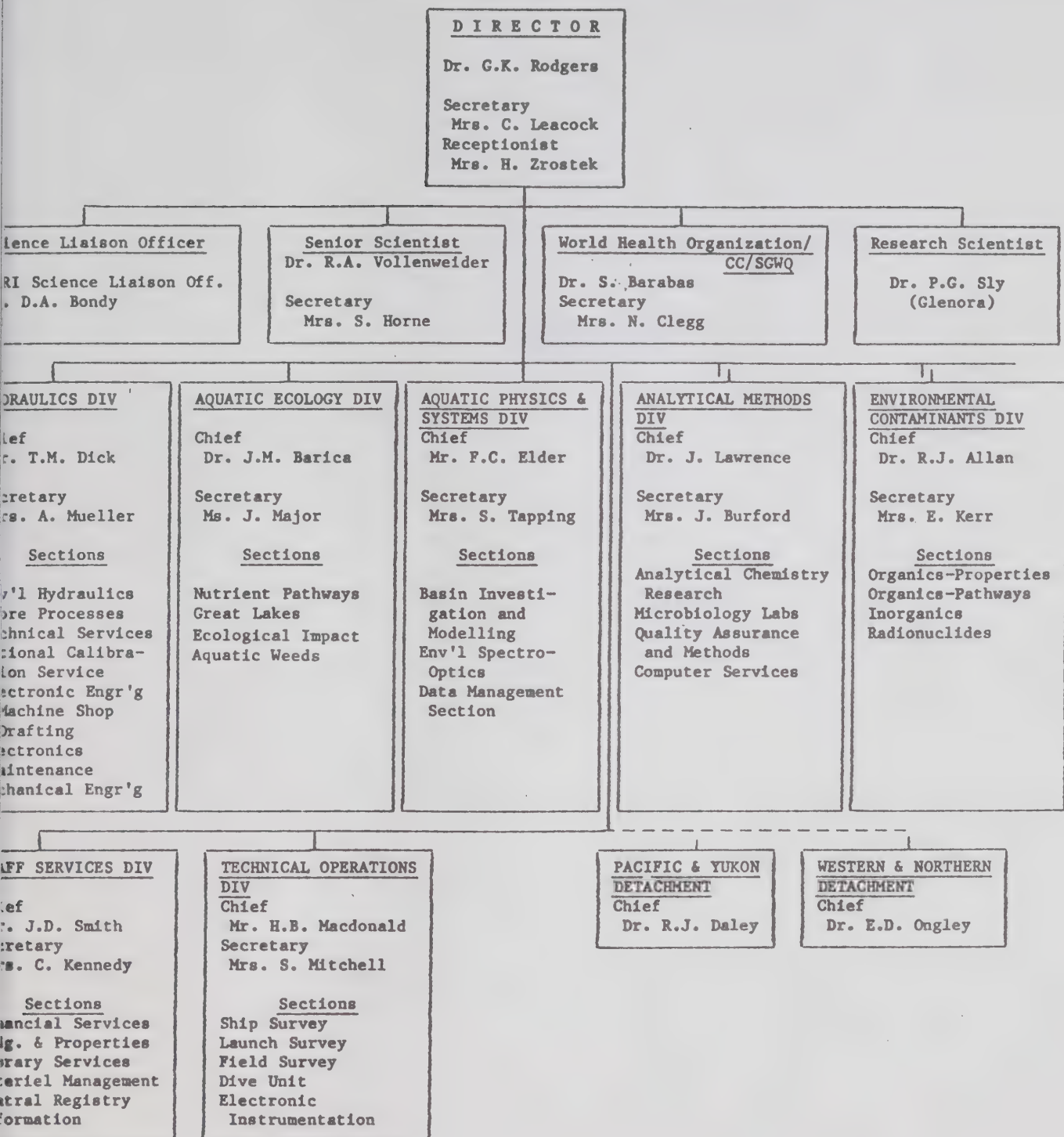
If it is required, more detailed management and scientific information is available from the managers and project leaders.

A handwritten signature in dark ink, appearing to read 'G.K. Rodgers', with a long horizontal line extending to the left.

G.K. Rodgers
Director

June 8, 1982

NATIONAL WATER RESEARCH INSTITUTE



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KEY WORD INDEX

KEY TO ABBREVIATIONS

Each project is indentified by a three digit number. The first digit identifies the responsibility centre.

- 1 - Director's Office
- 2 - Environmental Contaminants Division
- 3 - Hydraulics Division
- 4 - Aquatic Ecology Division
- 5 - Aquatic Physics and Systems Division
- 6 - Analytical Methods Division
- 8 - Technical Operations Division
- 9 - Staff Services Division

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DIRECTOR'S OFFICE

STUDY TITLE	NWRI BRANCH MANAGEMENT	DIV OR ORG NWRI
KEY WORDS	MANAGEMENT	SEC'N OR GRP BRANCH
STUDY LEADER	Rodgers, G.K. TEL: 637-4625	PAE 1901
TEAM MEMBERS	Leacock, C.D. Zrostek, H. and NWRI Management Team	DATE 82/02/08
ECS PROGRAM	MANAGEMENT AND ADMINISTRATION	
ACTIV ELEM	Regional Activity Management	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINEGOALS

1. Improve effectiveness through IMPAC -
 - (a) Develop new NWRI Strategic Plan (October 1982).
 - (b) Develop more quantitative project planning beyond one fiscal year (develop as part of FY 83/84 planning system).
 - (c) Prepare NWRI input to ECS planning process.
2. To achieve NWRI targets for affirmative action plans. (Targets as defined in HQ memoranda.)
3. To improve Human Resource Management in NWRI -
 - (a) Formulate complete Training and Development program.
 - (b) Review Employee Assistance Program.
4. To complete the Director's review of NWRI programs and management practice.

STUDY TITLE	EUTROPHICATION	DIV OR ORG NWRI
KEY WORDS	EUTROPHICATION, OECD	SEC'N OR GRP RESRCH
STUDY LEADER	Vollenweider, R.A.	TEL: 637-4242 PAE 1715
TEAM MEMBERS	Janus, L. Horne, S.M.	DATE 82/02/08
ECS PROGRAM	WATER MANAGEMENT RESEARCH	
ACTIV ELEM	AQUATIC ECOLOGY	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

- 1.-Evaluation of the total OECD data base re: Eutrophication Control.
 - Integration and analysis of the combined OECD data base on eutrophication in order to substantiate, modify and amend OECD conclusions.
 - The OECD data material collected over several years has not been fully analyzed. In particular, a better combination of data in regard to limnological lake types (shallow, deep, high-slow flushed lakes, etc.) is desirable to reduce prediction uncertainties and improve applicability of the OECD results. Analysis to be completed in Fiscal Year 1982/83.
- 2.-Preparation of WHO working document on Eutrophication Control in Reservoirs with Particular Emphasis on Warm Water Climate Problems. Conservation and optimization of water resources is crucial in warm climates. A recent symposium on reservoir eutrophication (Vienna, September 1981) has indicated many unsolved problems in applied reservoir limnology which calls for reassessment of the present state of knowledge in this field. Warm water limnology is a special sector yet to be understood in a broader context. Present knowledge does not guarantee provision of safe drinking water all the time, and at economically acceptable costs. Prepare literature review - December 1982.
- 3.-Preparation of Eutrophication Text Book and related papers.
 - Paper on prediction of eutrophication effects in waters of variable turbidity.
 - Review of OECD Cooperative Study on Eutrophication.
 - Paper on Prediction of Hypolimnetic Oxygen Depletion Rates.
 - Text Book.
 - Material for these publications is already compiled and, in part, papers are in preparation.
- 4.-International activities such as:
 - UNESCO continuation of modified OECD study (probably first step is production of manual for developing countries).
 - Continuation with PAHO in Argentina and likely in Brazil is expected this year.
 - Cooperation with Australia on reservoir problems has been initiated from invitation by CSIRO for Workshop meeting in November 1982.

STUDY TITLE	WHO COLLABORATING CENTRE ON SURFACE AND GROUNDWATER QUALITY	DIV OR ORG NWRI
KEY WORDS	WATER QUALITY, DATA COLLECTION, DATA QUALITY, GEMS/WATER, GROUNDWATER, INTERNATIONAL RELATIONS, TECHNOLOGY TRANSFER	SEC'N OR GRP WHO/CC
STUDY LEADER	Barabas, S. TEL: 637-4309	PAE 1916
TEAM MEMBERS	Clegg, N.J. Rogalsky, J.	DATE 82/02/08
ECS PROGRAM	MANAGEMENT AND ADMINISTRATION	
ACTIV ELEM	WORLD HEALTH ORGANIZATION (WHO)	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

1. Publication of the quarterly journal WATER QUALITY BULLETIN, Vol. 7, No. 2, 3 and 4 and Vol. 8, No. 1 by January 1983.
2. Publication du journal trimestre BULLETIN DE LA QUALITE DES EAUX, Vol. 7, No. 2, 3 et 4 et Vol. 8, No. 1 jusque'a mars 1983.
3. GEMS/WATER Annual Report of global water quality data for 1981 (by June 1982); hosting an international meeting on GEMS/WATER Analytical Quality Control at NWRI, Burlington, Ontario (April 1982).
4. Coordinating study programs for foreign visitors to CCIW and consultancies abroad.

Canada's commitment to the World Health Organization to assume the responsibilities inherent in the designation of the National Water Research Institute as the WHO Collaborating Centre on Surface and Ground Water Quality. Such responsibilities comprise coordination of international programs aimed at preserving and/or restoring the quality of major surface and ground water bodies.

1. & 2. Vol. 7, No. 2 English (April 1982), French (June 1982)
Vol. 7, No. 3 English (July 1982), French (September 1982)
Vol. 7, No. 4 English (October 1982), French (December 1982)
Vol. 8, No. 1 English (January 1983), French (March 1983)
3. GEMS/WATER - as per information provided above.
4. Foreign Visitors & Consultancies - as required.

NATIONAL WATER RESEARCH INSTITUTE**Study Plan****NO: 82- 106**

STUDY TITLE	SPECIAL RESEARCH ASSIGNMENTS	DIV OR ORG NWRI
KEY WORDS	REGIONS, SPECIAL PROJECTS	SEC'N OR GRP RESRCH
STUDY LEADER	Rodgers, G.K. TEL: 637-4625	PAE 1700
TEAM MEMBERS		DATE 82/02/08
ECS PROGRAM	WATER MANAGEMENT RESEARCH	
ACTIV ELEM	RESEARCH SUPPORT	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

The goal is to provide a reasonable degree of support for regional program and deserving new initiatives that arise during the FY, without disrupting the allocations made in February of the previous FY.

STUDY TITLE	SPAWNING/NURSERY GROUND SURVEYS	DIV OR ORG NWRI
KEY WORDS	GREAT LAKES, HABITAT, BOTTOM SUBSTRATES	SEC'N OR GRP RESRCH
STUDY LEADER	Sly, P.G. TEL: 476-6556	PAE 1715
TEAM MEMBERS	Sandilands, R.G. (AED)	DATE 81/12/15
ECS PROGRAM	WATER MANAGEMENT RESEARCH	
ACTIV ELEM	AQUATIC ECOLOGY	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

GOALS: To define characteristics of spawning/nursery habitats suitable for use by Great Lakes Whitefish and Lake Trout, and to determine factors which influence successful use or failure of such sites.

RELEVANCE: The revised Great Lakes Water Quality Agreement, the Strategic Planning for Ontario Fisheries, and the GLEER Report to the Great Lakes Fisheries Commission emphasize ecosystem management. We want to take advantage of recent improvements in Great Lakes Water Quality, to seek re-establishment of self-sustaining stocks of desirable fish species. The nearshore zone of the Great Lakes is a very sensitive component of the lacustrine environment, where; the interaction of both watershed & lake management practices impact most heavily on the natural system. This zone includes habitats whose characteristics are dominated by the interaction of waves, ice, circulation, temperature, substrate and water quality. The survival of fish stocks depends upon the number and size of spawning sites and their suitability.

WORK OUTLINE:

1. Reports will be completed describing the complexities of different substrate types at a number of historic spawning sites, used by Lake Trout and Whitefish, in Lake Ontario, Georgian Bay and Lake Superior (based on previous years' field work).
2. A study of seasonal changes on a Lake Ontario gravel beach (Lake Trout spawning site) will be submitted for publication. Publications will be prepared on i) seasonal changes in a gravel bank, ii) factors affecting suitability of spawning sites, and iii) deep water spawning sites.
3. An analysis of the east Lake Ontario Whitefish fall catch data and temperature regime will be attempted as a means of identifying stock behaviour and a more precise spawning habitat selection.
4. Final beach survey at the Snow Shoe Bay, April 1982.
5. A study of a Lake Trout spawning site in an Algonquin lake.
6. Field studies in the Bay of Quinte will be made with GLBL and OMNR to determine if existing acoustic equipment can be used to locate small groups of (large) fish in shallow water.
7. Observations of spawning Lake Trout at other sites in eastern Lake Ontario may be attempted (November).

STUDY TITLE	EQUAL OPPORTUNITIES FOR WOMEN	DIV OR ORG NWRI
KEY WORDS	EOW	SEC'N OR GRP BRANCH
STUDY LEADER	Stafford, J.A. (EPS) TEL: 637-4369	PAE 1905
TEAM MEMBERS	Carey, J., Coburn, J., Jagoe, J. Leacock, C., Rae, E., Snell, E.	DATE 82/02/08
ECS PROGRAM	MANAGEMENT AND ADMINISTRATION	
ACTIV ELEM	Administration	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

That the proportion of DOE men and women within each occupational group employed by the Department at the Canada Centre for Inland Waters will be brought into line with the proportion of qualified, interested and available men and women.

Relevance:

Implementation of the Departmental Equal Opportunities for Women Program.
Compliance with representation on the Regional EOW Committee and the formation of a volunteer committee for DOE at the Canada Centre for Inland Waters.

Work Outline:

Committee meetings.
Management Reports, year-end summary.
Resource Centre maintained.
Workshops, Seminars, and films for presentation.
Compile statistics - male/female ratio annually.
Equipment purchase Resource Centre.
Book purchases - EOW Library.
Members attend outside seminars and workshops for information.
Liaison with other EOW committees or other programs for information and support.

Management Contact for NWRI:

Mr. J.D. Smith
Chief, Staff Services Division

STUDY TITLE	Science Liaison Office	DIV OR ORG NWRI
KEY WORDS	Administration, Budget, EIS, IJC, Plan, Program Documentation	SEC'N OR GRP BRANCH
STUDY LEADER	Bondy, D.A. TEL: 637-4207	PAE 1903
TEAM MEMBERS	N/A	DATE 82/02/08
ECS PROGRAM	Management & Administration	
ACTIV ELEM	Support Services General	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

1. Coordinating NWRI Work Planning leading to a Branch Strategic Plan by August 1982.
2. Liaison with IWD Headquarters on such topics as: WRAC, WRRSP, Unsolicited Proposals, WRRR, PDF's, etc. as per schedules.
3. Liaison with other parts of the department on such topics as: GLWQA Program, TCMP, LRTAP, Canadian Climate Program, Energy & Environment, EARP, etc. as required.
4. Acting as staff officer to the Director on his committee responsibilities, eg: SAB/IJC, IWD Directors, ECS Directors, etc., meetings.
5. To provide information on NWRI Scientific programs in general and be contact for all such technical enquiries.

NATIONAL WATER RESEARCH INSTITUTE**Study Plan****NO: 82- 161**

STUDY TITLE	MANAGEMENT AND SCIENTIFIC ADVICE	DIV OR ORG NWRI
KEY WORDS	Administration, budget, committees, management personnel, staffing	SEC'N OR GRP PY/RGN
STUDY LEADER	Daley, R. TEL: 926-2567	PAE 1700
TEAM MEMBERS	C. Pharo, E. Carmack, C.B. Gray, M. Bothwell	DATE 82/03/10
ECS PROGRAM	Water Management Research	
ACTIV ELEM	General	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

1. To manage branch programs efficiently according to work plan and to evaluate regional research needs in limnology and river ecology for long-term planning purposes.
2. To provide scientific advice on matters relating to regional freshwaters.
3. Co-ordinate planning, fieldwork, data analysis and writing efficiently and effectively; liaise with NWRI-HQ; maintain facilities safely; undertake public information activities.

STUDY TITLE	SOUTHERN BRITISH COLUMBIA LAKES LIMNOLOGY	DIV OR ORG NWRI
KEY WORDS	Eutrophication, lake impact, water quality	SEC'N OR GRP PY/RGN
STUDY LEADER	Carmack, E.C. TEL: 926-2014	PAE 1700
TEAM MEMBERS	R. Daley, C. Gray, C. Pharo, S. Jasper, E. Marles, V. Chamberlain, R. Kirkland	DATE 82/03/10
ECS PROGRAM	Water Management Research	
ACTIV ELEM	General	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

To continue ongoing, selective investigations on the sources, composition, surface and subsurface transportation and limnological redistribution of nutrients in southern B.C. lakes and to report results to scientific managers.

Relevance

Eutrophication of the intermontaine lakes of southern B.C. is a widespread, continuing problem, and as elsewhere, difficult to quantify on a lake-by-lake basis. This is due to a lack of knowledge about the quantitative contributions of diffuse (logging, agriculture) and groundwater nutrient sources to lake loadings, nutrient bioavailability related to source, in-lake nutrient retention efficiencies and rates of nutrient supply to phytoplankton. These knowledge gaps also exist elsewhere, but without specific information from the unique river basins of this region, management actions for prevention, mitigation or restoration will continue to be hampered.

Work Outline

1. Write journal manuscripts on the following: Kamloops nutrient economy (1, CBG), Kootenay nutrient budget (1, CBG), Kootenay sedimentology (1, CHP), Kootenay internal waves & water masses (2, ECC), Kootenay impoundment effects (1, RJD), and Wood Lake physics (1, RCW). (2 by Oct. 1, 1982; 2 by Jan. 1, 1983 and 3 by March 31, 1983).
2. Complete analysis and write final report on Okanagan tributary nutrient composition (CBG). (August 1, 1982).
3. Develop and make operational a gas-chromatographic field method for measurement of CO₂, CH₄, and O₂, and continuous-flow centrifuge and SEM methods for analysis of suspended particulates. (Where appropriate, in place by March 31, 1983).

Work Outline continued

4. Assist NWRI-HQ with Okanagan marl-phosphate co-precipitation study. (100 chemical analyses during summer 1982 and advice by March 31, 1983).
5. Prepare proposal for future diffuse or groundwater nutrient research & complete 1983-84 project workplan. (January 1, 1983).

STUDY TITLE	THOMPSON RIVER PERIPHYTON ECOLOGY	DIV OR ORG NWRI
KEY WORDS	Streams, phosphorus availability, ecology, algal growth, impact	SEC'N OR GRP PY/RGN
STUDY LEADER	Bothwell, M.L. TEL: 926-0811	PAE 1700
TEAM MEMBERS	S. Jasper, U. Suzuki, R. Daley	DATE 82/03/10
ECS PROGRAM	Water Management Research	
ACTIV ELEM	General	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

To develop or adapt modern-day methods to quantify the relationship between phosphorus concentrations and rates of growth of Thompson River periphyton, as modified by temperature, light, and flow-regimes, and to provide predictive generalizations about these relationships (if practical in the form of a simulation model) for impact assessment purposes, in the Thompson River and elsewhere. Transfer of methods to operational users is emphasized.

Relevance

Nuisance growths of benthic algae in the Thompson River near Kamloops, a serious problem since the 1960's, are known to be caused by point-source phosphorus pollution. However, remedial management actions, such as effluent control, have been hampered by lack of information on the quantitative response of periphyton to phosphorus levels. This situation is common in the region and across Canada because existing methods of assessing the impacts of development on the biological productivity of rivers are, for the most part, crude, qualitative and non-predictive.

Work Outline

1. Undertake minor experiments to confirm validity and constraints of light/dark flowing trough methodology established in 1980-81. (July 1, 1982).
2. Publish results of previous phases of Thompson research. (July 1, 1982 and March 31, 1983).
3. Determine effects of WEYCAN pulpmill effluent P-removal program on P concentration and algal growth in lower river during winter, 1983. (March 31, 1983).
4. Assess site location for multi-trough facility. (January 1, 1983).
5. Design multi-trough apparatus and related facilities. (March 31, 1983).

Work Outline continued

6. Design in-trough, short-term incubator for algal metabolism measurements (^{32}P , ^{14}C , uptake, O_2 evolution). (March 30, 1983).
7. Transfer trough technology to "seconded" WEYCAN personnel. (Sept. 30, 1982).
8. Finalize long-term plan (by Oct. 1, 1982) and 1983-84 workplan (by Jan. 1, 1983).

STUDY TITLE	YUKON BASIN LIMNOLOGY	DIV OR ORG NWRI
KEY WORDS	Lake, ecosystem, physical limnology, geochemistry nutrients, water quality	SEC'N OR GRP PY/RGN
STUDY LEADER	Pharo, C.H. TEL: 922-6912	PAE 1700
TEAM MEMBERS	E.C. Carmack, C.B. Gray, S. Jasper, R. Wiegand, E. Marles, V. Chamberlain, P. Hamblin, R. Daley	DATE 82/03/10
ECS PROGRAM	Water Management Research	
ACTIV ELEM	General	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINEGoals

To document by 1986 the essential limnological characteristics of typical large northern lakes and provide predictive generalizations about their sensitivity to environmental alterations, if possible through simulation modelling. The Yukon River basin headwater lakes, where the study will occur, are typical examples of the northern lakes.

Relevance

Hydro developments in northern B.C. and the Yukon over the next two decades will create new reservoirs or alter natural lakes, with secondary impacts, in both cases, on downstream river quality. Other mining and industrial developments may also affect river, lake and reservoir water quality. However, almost nothing is known about the limnology of northern regional lakes, and given their unique characteristics, extrapolations from knowledge of southern lakes may be inaccurate. Without better knowledge of the processes controlling the dynamics of these lakes, predictions of their environmental sensitivity, or insensitivity, to development activities may be misleading or impossible.

Work Outline

1. Complete the bathymetry of Bennett, Tagish and Atlin Lakes and compute morphometric parameters. (March 31, 1983).
2. Complete sedimentology survey and physics transect monitors. (March 31, 1983).
3. Design and undertake exploratory reconnaissance of nutrient chemistry and microbiology, summer and winter, along headwater lake transect. (March 31, 1983).
4. Undertake process study of sediment transport pathways, plume turbidity and geochemical characteristics and sediment deposition in Kluane Lake. (March 31, 1983).

Work Outline continued

5. Design and carry out under-ice river plume dynamics study in Lake Laberge. (March 31, 1983).
6. Liaise with staff of Aquatic Physics & Systems Division, NWRI-HQ, in initial development of northern lake (ice-cover) model. (Progress report by Feb. 1, 1983).
7. Prepare long-term operational plan (by Oct. 1, 1982) and project work plans for 1983-84 (by Feb. 1, 1983).

STUDY TITLE	MERCURY AND OTHER HEAVY METAL POLLUTANTS IN QU'APPELLE RIVER SYSTEM	DIV OR ORG NWRI
KEY WORDS	Bioavailability; biogeochemistry; contaminants transport; heavy metals; lake; rivers; transport chemical forms; water quality	SEC'N OR GRP WN/RGN
STUDY LEADER	Jackson, T.A. TEL: 269-7379	PAE 1500
TEAM MEMBERS	E.D. Ongley, J. Tisdale, R. Woychuk.	DATE 82/03/12
ECS PROGRAM	River Basin Implementation	
ACTIV ELEM	General	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINEGoals

To identify sources, pathways and bioavailability of mercury and other heavy metal pollutants in the Qu'Appelle River-Fishing Lakes system in order to evaluate remedial alternatives. In FY 82/83, to collect all or most of the field samples (water, sediments, and organisms), starting in the spring of 1982, and to complete a large part of the analytical work on these samples.

Relevance

The study involves a site-specific regional problem in which the Federal & Sask. government agencies involved in the Qu'Appelle Implementation agreement have expressed an interest. Mercury pollution in this important regional waterway poses a threat to commercial and recreational fishing, and hence to the economy and health of people in the area as well as to the general ecology of the rivers and lakes of the system.

Work Outline

Samples of water, suspended sediment, bottom sediment, and biota (both flora and fauna) will be collected from sites in the Qu'Appelle River, Fishing Lakes and tributaries (including Thunder Creek, Moose Jaw River, Wascana Creek, and outflow of Last Mountain Lake) at different seasons representing major hydrologic regimes (spring flood, summer slack-water period, etc.). Three or four one-week field trips are anticipated. Total heavy metal concentrations, and forms of metals (e.g. methyl mercury and other extractable species) in samples and sample fractions will be determined, and their relationship to various physicochemical and biological factors involved in metal-binding. Standard physical separation techniques (e.g. centrifugation of water in the field) and selective extractions will be used to separate different forms of metals to help assess the bioavailability of the metals. The role of representative biological species as accumulators of metals will be assessed. Seasonal variations in the loadings of metals and metal species will also be studied. Sources of metal contamination will be studied by analysis of dredge samples and aquatic vegetation.

STUDY TITLE	MICRO-ORGANISM UPTAKE AND TRANSFORMATION OF MERCURY AND OTHER METALS	DIV OR ORG NWRI
KEY WORDS	Bacteria; biogeochemistry; biotransformation; contaminants; environmental simulation; geochemistry.	SEC'N OR GRP WN/RGN
STUDY LEADER	Jackson, T.A. TEL: 269-7379	PAE 1700
TEAM MEMBERS		DATE 82/03/12
ECS PROGRAM	Water Management Research	
ACTIV ELEM	General	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINEGoals

Experimentally evaluate mechanisms of uptake and release and speciation of mercury and other heavy metal forms by selected aquatic organisms and inorganic material.

Relevance

This project is highly relevant to every other, past, on-going and future study of mercury and other heavy metals. Empirical study of polluted natural systems must be supplemented by experiments such as these to help determine mechanisms and cause-and-effect relationships. The mechanisms to be investigated are of key importance from the standpoint of bioavailability and pollution control.

Work Outline

Several alternatives are being considered, and the choice will depend in part on the outcome of experimental studies currently underway. However, the tentative plan is to continue and extend a current study initiated in Dec., 1981. Sediment samples are incubated whilst suspended in solutions of inorganic mercury in sterilized flasks, using suitable controls. Sedimentary environments will be varied - e.g. by addition of metal-binding substances found in natural sediment (oxides, clay, humic matter, sulfide, etc.), by varying the redox conditions and by adding organic substrates for microbes (e.g. dead algae or chironomids). The effects of these treatments on microbial growth and the microbially controlled partitioning and speciation of mercury will be monitored by measuring mercury sorption, methyl mercury production, and production of methane and CO₂ in the head gas. Demethylation will be studied by comparable experimentation with methyl mercury instead of inorganic mercury. Similar experiments will be done with other metals (e.g. copper) and mixtures of mercury and other metals to study synergistic effects.

STUDY TITLE	ORIGIN AND PATHWAYS OF MERCURY IN NORTHERN MANITOBA RESERVOIRS	DIV OR ORG NWRI
KEY WORDS	Heavy metals; lake; bioavailability; biogeochemistry; contaminants; rivers; water quality.	SEC'N OR GRP WN/RGN
STUDY LEADER	Jackson, T.A. TEL: 269-7379	PAE 1500
TEAM MEMBERS	R. Woychuk	DATE 82/03/12
ECS PROGRAM	River Basin Implementation	
ACTIV ELEM	General	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINEGoals

To determine cause of elevated mercury levels in fish in impoundments on Churchill and Rat River systems, with particular reference to sources of mercury and mobilization of mercury into the food web. In FY 82/83, to collect all or most of the field samples and field data, and to complete a substantial portion of the laboratory program.

Relevance

This is a Canada Water Act Study currently being negotiated between Federal Government (including DOE and DFO), Manitoba Government, and Manitoba Hydro. Along with other ill effects of impoundment, the increased mercury levels in fish may pose a threat to economy and health of native fishermen in the area.

Work Outline

Comparative research on (1) possible sources of mercury (notably shoreline vegetation and soil and river silt) and (2) biogeochemical pathways and speciation of mercury (especially efficiency of methyl mercury production) involving detailed biogeochemical survey of selected flooded and non-flooded aquatic environments and terrestrial environments bordering them. Samples of terrestrial vegetation (moss, herbaceous plants, trees, etc.) and soil and muskeg will be collected in the spring or summer, and samples of surface and near-bottom water, suspended particulates, plankton, benthos, and bottom sediments will be collected at different seasons representing major hydrologic regimes (primarily spring flood and mid-summer slack-water period). Biological samples will be analyzed for mercury and other metals; water, particulates, and sediments will be analyzed for total metals, methyl mercury, and variety of physicochemical parameters and constituents relevant to mercury cycling. The effect of environmental conditions (e.g. flooded vs. unperturbed and clay-rich vs. clay-poor) on the methylation, availability and partitioning of mercury and other selected metals will be examined, as will relative and absolute abundances of mercury and other metals in various land plants and shoreline materials. These data will be compared and correlated with relevant data collected by DFO. Cores will be taken to assess historical vs. present mercury levels.

STUDY TITLE	SUSPENDED-SEDIMENT COLLECTION AND SENSING TECHNOLOGY	DIV OR ORG NWRI
KEY WORDS	Aquatic physics; instrumentation; rivers; suspended solids.	SEC'N OR GRP WN/RGN
STUDY LEADER	Kenney, B.C. TEL: 269-7379	PAE 1716
TEAM MEMBERS	J. Mollison, E.D. Ongley	DATE 82/03/12
ECS PROGRAM	Water Management Research	
ACTIV ELEM	Aquatic Physics and Systems	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINEGoals

Development of long-term bulk collection of suspended sediments and low cost expendable turbidity sensing technology. In FY 82/83:

- 1) Complete operational assessment of time-integrating suspended sediment collector.
- 2) Conduct feasibility study of an inexpensive optical sensing device for determining instantaneous suspended sediment concentrations for research purposes.

Relevance

Many toxic substances are transported in rivers and lakes in conjunction with fine-grained sediment. Existing sensor technology is too expensive for use in high risk situations such as floods when most of the sediment transport occurs.

Work OutlineGoal #1

A suspended sediment collector has been devised for use in shallow lakes to collect bulk samples over medium to long time intervals. The sampler will be redesigned for river use and field trials will be conducted.

Goal #2

- 1) Conduct a literature search of sensor technology available to measure turbidity and/or suspended sediment concentrations.
- 2) Evaluate feasibility of designing a low-cost suspended sediment concentration sensor to be used for important but high risk measurements during flood stages.
- 3) If concept proves feasible, commence development of suitable prototype.

STUDY TITLE	PRAIRIE LAKE PHYSICS	DIV OR ORG NWRI
KEY WORDS	Aquatic physics; data management; EDP programming; instrumentation; physical limnology	SEC'N OR GRP WN/RGN
STUDY LEADER	Kenney, B. TEL: 269-7379	PAE 1716
TEAM MEMBERS	J. Mollison.	DATE 82/03/12
ECS PROGRAM	Water Management Research	
ACTIV ELEM	Aquatic Physics and Systems	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINEGoals

To quantify physical mixing and sediment resuspension in shallow prairie lakes in order to better understand eutrophication processes. In FY 82/83 complete data analysis phase of hypereutrophic prairie lake study.

Relevance

Lake eutrophication hampers many uses of the limited water supply available on the prairies. This study was conducted to examine aspects of lake physics important to the eutrophication process.

Work Outline

During 1978, 3.3 million data points were recorded from an array of 42 hydro-meteorological and hydrodynamical sensors mounted on a tower in Lake Manitoba. Using a similar sensor array, 3.2 million data points were recorded in Rock Lake in 1979. Post experiment calibration of the instrumentation was completed in 1980 and data archiving was completed in 1981. Some software development for data editing as well as for data processing and analysis was done in 1981/82. The 1982/83 work plan includes:

- 1) System familiarization and implementation of the PDP 11/23 computer and peripheral hardware.
- 2) File transfer of Lake Manitoba and Rock Lake data from the University of Manitoba Amdahl computer to the PDP 11/23.
- 3) Conversion and debugging of all existing software from the Amdahl operating system to the PDP operating system.
- 4) Completion of software development required for data analysis.
- 5) Analysis and synthesis of Lake Manitoba and Rock Lake data.
- 6) Write a report on Lake Manitoba and commence write-up of Rock Lake data.

NATIONAL WATER RESEARCH INSTITUTE

Study Plan

NO: 82-177

STUDY TITLE	BAROCLINIC MASS EXCHANGE UNDER WINTER ICE IN LONG BAY	DIV OR ORG NWRI
KEY WORDS	Aquatic physics; instrumentation; physical limnology	SEC'N OR GRP WN/RGN
STUDY LEADER	Kenney, B. TEL: 269-7379	PAE 1716
TEAM MEMBERS		DATE 82/03/12
ECS PROGRAM	Water Management Research	
ACTIV ELEM	Aquatic Physics and Systems	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINEGoals

To evaluate the importance of baroclinic mass exchange in Long Bay, South Indian Lake, during winter. Completion of program in FY 82/83.

Relevance

Under-ice exchange is critical to water and chemical budget studies being conducted in Long Bay by staff of DFO. NWRI has been requested to provide the expertise and equipment required to measure these important but low velocity flows.

Work Outline

The data collection phase of the project is scheduled for completion in FY 81/82. Analysis of field data will be completed in FY 82/83 and an assessment of the impact of baroclinic circulation on the residence time of Long Bay will be reported by December, 1982.

STUDY TITLE	PALAEOLIMNOLOGY OF PASQUA LAKE, SASKATCHEWAN	DIV OR ORG NWRI
KEY WORDS	Benthos; biota; bottom substrates; contaminants; nutrients; sediment	SEC'N OR GRP WN/RGN
STUDY LEADER	Warwick, W. TEL: 269-7379	PAE 1500
TEAM MEMBERS		DATE 82/03/12
ECS PROGRAM	River Basin Implementation	
ACTIV ELEM	General	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINEGoals

- 1) To develop an historical perspective of eutrophication, sedimentation and contamination processes in the Qu'Appelle River Lakes, and
- 2) To recommend, if practical, possible remedial measures to improve present lake trophic conditions.

Relevance

Under the Qu'Appelle Agreement, federal/provincial expenditures have been directed towards reducing nutrient inputs into the Qu'Appelle River Lakes through a variety of projects including implementation of tertiary treatment of Regina wastes, advanced treatment for Moose Jaw wastes, feed lot containments, upgrading of municipal waste treatment facilities and others. This study seeks to determine whether the lakes were eutrophic, and at what level of trophy, before modern society developed on the prairies and/or if trophic levels have been altered as a result of the development of modern society. This study will establish criteria against which the success or failure of these restoration procedures may be measured and to ascertain what levels of success may legitimately be expected based on the past history of the lakes.

Work Outline

Subject to availability of funding from Qu'Appelle Implementation Board:

- 1) Development of the geochronology of Pasqua Lake Site P-7 will be begun under contract as follows:
 - palynology
 - C-14
 - Pb-210
- 2) Cross-correlate Cores P-7-S and P-7-N by ignition analysis as necessary pre-condition to development of geochronology.
- 3) Limited expansion of the fossil chironomid data base directed towards sedimentation/drought prediction processes to be undertaken subject to program timing.

STUDY TITLE	THE TOBIN LAKE PROJECT	DIV OR ORG NWRI
KEY WORDS	Biassay; bioavailability; contaminants; dioxins; ecosystem; methods development; microbiology; toxic substances	SEC'N OR GRP WN/RGN
STUDY LEADER	Warwick, W.	TEL: 269-7379 PAE 1715
TEAM MEMBERS		DATE 82/03/12
ECS PROGRAM	Water Management Research	
ACTIV ELEM	Aquatic Ecology	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINEGoals

- to establish causality between deformities in chironomid larvae and environmental contaminants and
- to develop a biological screening tool to detect and assess the presence and significance of contaminants in aquatic ecosystems.

In FY 82/83:

Finalize analysis, identification and documentation of morphological deformities in chironomid faunas from Sites 2, 5, 9 and 17 and prepare documentation of this for inclusion as part of an overall Project Report.

Relevance

Environmental contaminants have been identified as one of the most urgent problems facing Canadians. Chemicals are present in a multitude of forms which, more often than not, interact in aquatic ecosystems so that sum total effect is greater than the component parts. The present project uses a holistic approach to develop a method using biological indicators, particularly the midge larvae (Chironomidae; Diptera) community, whereby contamination problems can be detected and their significance assessed before resorting to more highly specific testing procedures.

Work Outline

The Tobin Lake Project is a multi-disciplinary I.W.D., E.P.S. and University of Manitoba study focusing on benthic community structure and composition, with particular reference to morphological deformities among larval chironomids, analysis of toxic fractions, and bioassay analysis using the nematode Panagrellus redivius and the Ames test.

The project is designed on the ecosystem approach. Rather than analyzing for specific chemicals, environmental samples are refined through successive fractionations and constant bioassay for those fractions displaying toxicity until the toxic fractions are reduced to the point that individual compounds comprising the fraction may be identified. The net toxicity is then compared

Work Outline continued

to systems biological response to assess the net effect of the contaminant load on the reservoir ecosystem.

Under the FY '82-'83 work plan:

- 1) complete all generic identification and documentation for Sites 2,5,9 and 17 by 31 Dec. '82.
- 2) continue collection and synthesis of chemical and biological data from balance of Tobin Lake sites as manpower becomes available.
- 3) sample sorting of A-replicate series to be completed (subject to availability of summer student staff).
- 4) preparation and mounting of chironomid larvae to continue with goal of completing mounting of chironomid larvae from 10 more sites (subject to availability of TCMP funding).

STUDY TITLE	CULTURAL IMPACT ON BENTHIC COMMUNITIES OF THE QU'APPELLE RIVER LAKES	DIV OR ORG NWRI
KEY WORDS	Benthos; contaminants; nutrients; toxicity; water quality.	SEC'N OR GRP WN/RGN
STUDY LEADER	Warwick, W. TEL: 269-7379	PAE 1715
TEAM MEMBERS	C. Casey	DATE 82/03/12
ECS PROGRAM	Water Management Research	
ACTIV ELEM	Aquatic Ecology	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINEGoals

Continue analysis, identification and documentation of morphological deformities in chironomid faunas resulting from varying degrees of toxic stress in the six Qu'Appelle River Lakes with the objective of developing a biological screening tool for contaminants. Complete identification of gastropod fauna from the Qu'Appelle River Lakes. Continue analysis of contemporary benthic communities from Fishing Lakes with the objective of completing all primary data gathering and analysis by 31 March, 1983.

Relevance

Eutrophication problems in the Qu'Appelle River Lakes have been considered a relatively recent phenomenon. There is evidence, however, that suggests that the lakes have always been eutrophic. The evidence for contaminants documented in the deformities in the chironomid populations of the lakes is supported by the decimation of the other components of the benthic community, significant inhibition of nematode development in bioassay experiments conducted on water collected from immediately above the sediment water interface, and measurements of toxic heavy metals.

Work Outline

Much more intensive analysis of benthic communities has been undertaken than originally intended because of unexpected effects of contaminants in the Qu'Appelle River Lakes. All sample specimens are being analyzed, rather than subsample populations, to define effects of contamination more precisely. Because of the interrelationship between contaminants and trophic processes, assessment of baseline trophic conditions based on the benthic communities has become much more complicated than originally anticipated.

- 1) preparation and mounting of chironomid larvae from Katepwa Lake, (spring, 1976) will be completed,
- 2) preparation and mounting of chironomid larvae from Katepwa Lake from subsequent years will be undertaken, subject to other program demands,
- 3) identification and evaluation of chironomid faunas from Pasqua, Echo and Mission Lakes completed,

Work Outline continued

- 4) identification and evaluation of gastropod faunas from the Qu'Appelle River Lakes (subject to finding availability) (Lubinsky),
- 5) sorting of benthic samples from selected prairie lakes for comparative purposes (subject to summer student availability),
- 6) preparation and mounting of chironomid larvae from prairie lakes for comparative purposes.

STUDY TITLE	EXPERIMENTAL TOXICOLOGY	DIV OR ORG NWRI
KEY WORDS	Bioassay; biota; contaminants; environmental simulation; toxic substances; water quality	SEC'N OR GRP WN/RGN
STUDY LEADER	Warwick, W. TEL: 269-7379	PAE 1700
TEAM MEMBERS	C. Casey	DATE 82/03/12
ECS PROGRAM	Water Management Research	
ACTIV ELEM	General	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINEGoals

To experimentally establish causality between morphological deformities in chironomid larvae and known contaminants in order to assess the adequacy of this biological screening tool to detect and assess effects of contaminants under field conditions. In FY 82/83 to continue development of experimental techniques and toxicological studies on the effects of known toxic compounds on chironomid larvae as time and manpower permits.

Relevance

The development of a 'biological screening tool' to detect and assess the presence and significance of contaminants in aquatic environments is based at present on circumstantial evidence which shows that deformed chironomid larvae are generally found in locations where contaminant materials are known to be present. Limited experimental data have confirmed that toxicants like DDE induce morphological deformities similar to those found under field conditions.

Work Outline

Two experiments using NTA and sulphuric acid were conducted during the summer of 1981. Preparation and mounting of subsamples from each of the experimental cultures is complete; further preparation and mounting remain pending the results of identification and evaluation procedure in progress.

Under the FY '82-'83 work plan:

- 1) preparation and mounting of larvae from the NTA and sulphuric acid experiments will be increased if preliminary analysis so indicates.
- 2) culturing techniques to be refined to determine optimum experimental conditions.
- 3) experiments exposing chironomid larvae to known or suspected toxicants such as DDE, methoxychlor, fenitrothion, etc. to be carried out. Scale of experiments contingent on availability of summer student staff.

STUDY TITLE	NUTRIENT AND CONTAMINANT TRANSPORT IN BOW AND OLDMAN RIVERS	DIV OR ORG NWRI
KEY WORDS	Biogeochemistry; contaminants transport; heavy metals; macrophytes; nutrients; phosphorus; rivers; statistical modelling; suspended solids; transport chemical forms	SEC'N OR GRP WN/RGN
STUDY LEADER	Ongley, E.D. TEL: 269-7379	PAE 1700
TEAM MEMBERS		DATE 82/03/12
ECS PROGRAM	Water Management Research	
ACTIV ELEM	General	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINEGoals

Complete programs on South Saskatchewan River and loadings simulations.

Relevance

- 1) S. Saskatchewan River program is providing new information on temporal and spatial distribution of nutrients and contaminants in major tributaries of this river system. This information has direct implications for surveillance programs and remedial action.
- 2) Error limits applicable to loadings calculations from compliance monitoring data are established in this study.

Work Outline

All data collection for the S. Saskatchewan River program is complete. Preliminary data synthesis is complete. Statistical analysis of data sets will be performed by a graduate student at Queen's University in the period April-July, prior to completing her MSc thesis in Sept. Interpretative reporting of results, focusing on spatial and temporal trend patterns, implications for monitoring programs, use of macrophytes and macroalgae as in-stream biosurvey tools, and applicability of remedial options in Calgary sewage control, will follow from the two theses (one on irrigation return flow). Interpretative work will be completed in FY 82/83.

Computer simulation of loadings calculations using a variety of loadings algorithms is completed. It remains to conduct additional literature review and to write up the results for journal publication.

STUDY TITLE	NUTRIENT AND CONTAMINANT PATHWAYS IN PRAIRIE DRAINAGE SYSTEMS	DIV OR ORG NWRI
KEY WORDS	Biogeochemistry; contaminants; transport; heavy metals; macrophytes; nutrients; rivers; sediments; suspended materials; transport chemical forms.	SEC'N OR GRP WN/RGN
STUDY LEADER	Ongley, E.D. TEL: 269-7379	PAE 1700
TEAM MEMBERS	T.A. Jackson, J. Tisdale, R. Woychuk.	DATE 82/03/12
ECS PROGRAM	Water Management Research	
ACTIV ELEM	General	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINEGoals

Establish long-term pathways and biogeochemical cycles of nutrients, heavy metals and organic contaminants in Qu'Appelle River-Fishing Lakes and N. Saskatchewan River in order to develop improved monitoring strategies and provide interpretive capability for existing monitored data sets. In FY 82/83, organize and run a field sampling program in summer and fall of 1982 on Qu'Appelle and N. Saskatchewan River systems and to complete 'total' and P analyses of field samples.

Relevance

The project will provide primary information on biogeochemical cycling in typical river and river-lake systems of the Canadian prairies. It addresses specific information requirements of federal-provincial agreements in the Qu'Appelle and federal concerns of toxic contaminant transport in the N. Saskatchewan River. The program is directed to improving data collection procedures in Program 1.6.

Work Outline

The program will centre upon a comparative study of the Qu'Appelle and N. Saskatchewan River systems. Data collection will be carried out at approximately 20 sites reflecting point and NPS sources, tributary inputs and potential sinks. Data will focus upon the mechanisms of in-stream transport and the relative changes and storage/release mechanisms associated with chemical partitioning amongst plant, suspended sediment and solute phases. The field program will characterize flux and transient storage conditions, typical of seasonal flow regimes on the prairies. Field sampling will reflect time-of-travel considerations and, for storm events, attempt to characterize relative importance of geochemical flux associated with solute/suspended sediment/organic solids transport phases over a range of flow conditions. Transient storage in aquatic biomass will focus upon macrophytes and macroalgae in the Qu'Appelle system. The N. Saskatchewan River, although devoid of significant macrophytes and macroalgae populations, appears to undergo a change from a phytoplankton-rich suspended sediment load during low flow, to a coarse-grained mineral

Work Outline continued

sediment load during high flow. The program will attempt to quantify these changes and evaluate the relevance of storm-flow monitoring proposals.

STUDY TITLE	DESIGN AND EVALUATION OF TIME-INTERGRATING WATER SAMPLER	DIV OR ORG NWRI
KEY WORDS	Instrumnetation; method development; rivers; technology transfer; water quality.	SEC'N OR GRP WN/RGN
STUDY LEADER	Ongley, E.D. TEL: 269-7379	PAE 1700
TEAM MEMBERS	J. Mollison	DATE 82/03/12
ECS PROGRAM	Water Management Research	
ACTIV ELEM	General	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINEGoals

To design and evaluate a sampler for collecting time-integrated water samples in routine application.

Relevance

This project is an operational research contribution to WQN-W&NR sampling program. Instantaneous samples are not necessarily reliable indicators of water quality. The objective is to assess alternative time-integrating samplers and to construct and evaluate an appropriate prototype.

Work Outline

NWRI will assume responsibility for designing and building a prototype in consultation with personnel of Water Quality Branch. Lab and field testing of equipment will be performed by WQB personnel under supervision of NWRI.

ENVIRONMENTAL CONTAMINANTS DIVISION

STUDIES FOR ENVIRONMENTAL CONTAMINANTS DIVISION

SECTION	STUDY	STUDY TITLE	STUDY LEADER
DIVISION	200	ENVIRONMENTAL CONTAMINANTS DIVISION RESEARCH MANAGEMENT AND ADMIN.	ALLAN, R. J.
	201	ENVIRONMENTAL CONTAMINANTS DIVISION COMMITTEE INVOLVEMENT	ALLAN, R. J.
	202	MAJOR CAPITAL EQUIPMENT PLAN	ALLAN, R. J.
INORGANICS	230	CHEMICAL SPECIATION AND BIOAVAILABILITY OF TOXIC ELEMENTS	LUM, K. R.
	231	HYDROGEOCHEMICAL RESPONSES OF TURKEY LAKES WATERSHED TO ACID RAIN	JEFFRIES, D. S.
	232	HEAVY METAL METHYLATION PROCESSES IN THE AQUATIC ENVIRONMENT	CHAU, Y. K.
	234	HEAVY METAL CHEMODYNAMICS IN THE NIAGARA R. AND PLUME	MUDROCH, A.
	235	GEOCHEMICAL CONTROLS OF AQUATIC SYSTEM RESPONSES TO ACID RAIN	JEFFRIES, D. S.
	236	AQUATIC REGIME ACIDIFICATION MODELS	LAM, D. C. L.
	237	SIMULATION OF TOXIC CONTAMINANTS FATE IN LAKE ONTARIO	HALFON, E.
ORGANIC PATHWAYS	220	ROLE OF SUSPENDED SOLIDS IN BENTHOS UPTAKE OF ORGANICS, NIAGARA R.	FOX, M. E.
	221	TOXIC ORGANIC SUBSTANCES IN PRECIPITATION	STRACHAN, W. M. J.
	222	SEDIMENT-WATER PARTITIONING OF TOXIC ORGANIC SUBSTANCES	STRACHAN, W. M. J.
	223	ACCUMULATION AND EFFECTS OF CONTAMINANTS IN AQUATIC BIOTA	METCALFE, J.
	224	PATHWAYS & EFFECTS OF ORGANICS IN EXPERIMENTAL FRESHWATER ECOSYSTEMS	SCOTT, B. F.
	225	ACCUMULATION/DEGRADATION OF ORGANIC CONTAMINANTS IN FLUVIAL SYSTEMS	CAREY, J.
ORGANIC PROPERTIES	210	PREDICTION OF CONTAMINANT HAZARD BY QSAR	KAISER, K. L. E.
	211	CALCULATIONS OF MOLECULAR PROPERTIES FOR SAR	KAISER, K. L. E.
	212	ORGANIC CONTAMINANTS SOURCES AND SINKS IN NIAGARA R. AND L. ONTARIO	KAISER, K. L. E.
	213	CHLORINATED HYDROCARBONS IN SEDIMENTS AND BIOTA OF THE GREAT LAKES	OLIVER, B. G.
	214	MICROBIAL DEGRADATION OF PCB'S	BAXTER, R. M.
	215	BACTERIAL DEGRADATION OF ORGANIC ENVIRONMENTAL CONTAMINANTS	LIU, D.
	216	CHEMISTRY OF CHLORINATED HYDROCARBONS AT THE AIR/WATER INTERFACE	PLATFORD, R. F.
	217	CONTAMINANT TOXICITY DEGRADATION BY YEASTS AND FUNGI	KWASNIENSKA, K.
	218	BIOAVAILABILITY OF ORGANIC CONTAMINANTS IN SEDIMENTS	OLIVER, B. G.
	219	ORGANOCHLORINE CONTAMINANTS IN SURFACE MICROLAYERS OF THE NIAGARA R.	PLATFORD, R. F.
	233	FATE OF ORGANOTINS IN AQUATIC SYSTEMS	MAGUIRE, R. J.
RADIONUCLIDES	240	TRENDS IN RADIOACTIVE CONTAMINANTS IN THE GREAT LAKES	DURHAM, R. W.
	241	RADIUM-226 PATHWAYS - PORT GRANBY WASTE MANAGEMENT SITE TO L. ONTARIO	DURHAM, R. W.
	242	RADIONUCLIDE PATHWAYS IN THE NIAGARA R. AND L. ONTARIO	JOSHI, S. R.
	243	AQUATIC PATHWAYS OF RADIONUCLIDES RELEASED BY URANIUM MINING	DURHAM, R. W.

STUDY TITLE	Environmental Contaminants Division Research Management and Administration	DIV OR ORG ECD
KEY WORDS	Management, administration	SEC'N OR GRP ECD DIV
STUDY LEADER	Allan, R.J. TEL: 637-4678	PAE 4200
TEAM MEMBERS	E. Kerr, N. Snelling, F. Boyd (SSD)	DATE 82/2/1
ECS PROGRAM	M.R.C. - Toxic Substances	
ACTIV ELEM	Toxic Substances	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

Plan, organize, manage and control the scientific and administrative program of the Environmental Contaminants Division.

Work Outline:

- a) Provide secretarial services, administrative services, staff training, conference and program travel, telephone services, equipment and building repairs, publication and journal reprint charges, freight and brokerage costs, photocopier services stores and word processing services.
- b) Coordinate study plan preparation, (quarterly written study progress); liaison with other federal, provincial, private agencies, and research grant reviews.
- c) Prepare staff appraisal and promotion documents.
- d) Convene regular monthly section meetings, other impromptu meetings as required for program development, biennial verbal discussions of projects with project leaders.

STUDY TITLE	Environmental Contaminants Division Committee Involvement	DIV OR ORG ECD
KEY WORDS	Contaminants, committees	SEC'N OR GRP ECD DIV
STUDY LEADER	Allan R.J. TEL: 637-4678	PAE 4200
TEAM MEMBERS	Division staff as required and approved by Division Chief	DATE 82/2/1
ECS PROGRAM	M.R.C. - Toxic Substances	
ACTIV ELEM	Toxic Substances	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

To act on committees to: a) review study proposals and allocate external funds;
b) review data, criteria documents, guidelines and provide advice or prepare integrated reports dealing with environmental contaminants.

Work Outline:

1. OECD Chemical Testing Program - Strachan
2. Canada/US Niagara River Study - Allan/Mudroch
3. Canada/Ontario English-Wabigoon Mercury Study - Allan
4. GLWQA, Lakes Toxic Contaminant - Allan
5. GLWQA, Aquatic Ecosystems Objectives - Strachan
6. GLWQA, Capital Equipment - Carey
7. IJC - SAB Task Force on Non-phosphate Detergents - Kaiser
8. CCIW Library - Scott
9. CCIW Safety - Tkacz
10. CCIW Open House - Platford
11. CCIW Capital Equipment Replacement - Lum
12. CCIW Dioxin Working Group - Carey
13. CCIW Cafeteria - Livermore
14. NWRI Newsletter - Kerr
15. NWRI Management Team - Allan
16. Equal Opportunities for Women - Carey
17. UN-FAO Marine Fouling Group - Liu
18. Standards Council of Canada - Chau/Liu
19. ASTM Oxygen Uptake Group - Liu
20. International Standards Organization - Scott
21. AGRAD Working Group on Fate of Oil - Nagy/Scott
22. DOE Ontario Shell Energy Team - Scott
23. ASTM Sediment Analysis Group - Chau
24. Ontario Region, EARP - Durham
25. IJC Radioactivity Working Group GLWQ - Durham
26. NRC on Pesticides and Industrial Chemicals (Aminocarb) - Maguire
27. Environmental Monitoring of Forest Insect Control - Maguire
28. ECA Evaluation Committee -Maguire/Strachan

STUDY TITLE	MAJOR CAPITAL EQUIPMENT PLAN	DIV OR ORG ECD
KEY WORDS	Capital, equipment	SEC'N OR GRP ECD DIV
STUDY LEADER	R.J. Allan TEL: 637-4678	PAE 4200
TEAM MEMBERS	Division Staff	DATE 82/2/1
ECS PROGRAM	M.R.C. - Toxic Substances	
ACTIV ELEM	Toxic Substances	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

GOALS: See individual studies.

RELEVANCE:

Major capital items can only be purchased at a Division level. Only rarely are individual studies of a nature which can justify large expenditures for items unique to one investigation.

In ECD, the technical to professional ratio is too low for historical reasons. The objectives in 1982/83 will be to compensate for this by purchasing:

- a) automatic sample processors for existing equipment;
- b) plotters and computerised data reduction systems.

STUDY TITLE	Prediction of Contaminant Hazard by QSAR	DIV OR ORG ECD
KEY WORDS	Structure, Toxicity, Toxic Substances	SEC'N OR GRP OPROPS
STUDY LEADER	Kaiser, K.L.E. TEL: 637-4244	PAE 4200
TEAM MEMBERS	Vacant (PDF), M. Comba, D. Liu, K. Kwasniewska, in collaboration with P.V. Hodson (GLBL), G. Dixon (UOW)	DATE 82/2/1
ECS PROGRAM	M.R.C. - Toxic Substances	
ACTIV ELEM	Toxic Substances	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

To develop and assess quantitative structure-activity correlations CQSAR as method to predict the hazard potential or organic contaminant to aquatic biota.

Relevance:

Structure-activity correlations are used as an important tool for the identification and prediction of biologically-active compounds in the development of medicinal compounds. In order to assess the environmental hazard potential of new contaminants and materials in a time and cost saving fashion, available biochemical data correlated with the physical and chemical characteristics and properties to arrive at the structure activity correlations for the compounds to be determined. The necessity for such a program has also been recognized by the Integrated Planning Management Activity (goal 5, A-Base Review) and has been identified as a Research Need in the Great Lakes Water Quality Agreement, 1978 and in the Priorities document of TCMC.

Work Outline:

Previous results indicate the possibility of using intraperitoneal injection LD50 values for rainbow trout as indicators for acute toxicity of phenol and benzene contaminants (1). This work will be expanded on with more compounds as well with further toxicity investigations on fish eggs and fry. The same contaminants will be investigated as to their toxic effects on certain bacteria, yeasts and fungi. Structure-toxicity relations between the different test organisms as well as between the different toxicants will be explored on the basis of Hansch-type equations. For further details, please refer to 19-page research proposal of September, 1981.

Reports Expected:

One on structure-activity correlations of benzene and chlorophenol derivatives. (Mar.)
One on octanol-water partition coefficients. (July)

STUDY TITLE	Calculations of Molecular Properties for SAR	DIV OR ORG ECD
KEY WORDS	Structure, Toxicity, Toxic Substances	SEC'N OR GRP OPROPS
STUDY LEADER	Kaiser, K.L.E. TEL: 637-4244	PAE 4200
TEAM MEMBERS	J. Cullen (PDF)	DATE 82/2/1
ECS PROGRAM	M.R.C. - Toxic Substances	
ACTIV ELEM	Toxic Substances	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

To develop and apply existing mathematical methods for the calculation of molecular properties.

Relevance:

Frequently, measurement of molecular properties of hazardous chemicals is not possible as the compounds may be extremely toxic, not available in the necessary quantity and so forth. Modern physico-chemical concepts allow the calculation of such parameters from the molecular structure alone. SAR is a research priority identified in the 1978 GLWQA.

Work Outline:

With the two major techniques (semi-empirical and ab initio), calculations will be made on selected chloro-biphenyls, dioxins, benzenes, phenols, and other compounds of interest. Parameters to be determined include intramolecular rotation barriers (in PCBs), ionization constants, dipole moments, and others. Such calculated parameters will then be used together with various literature toxicity data to investigate the structure-activity correlations and in particular the possibility of calculating hazards of contaminants.

Reports Expected:

One on calculated rotation barriers of chlorohiphenyl isomers.

NATIONAL WATER RESEARCH INSTITUTE

Study Plan

NO: 82-212

STUDY TITLE	Organic Contaminants Sources and Sinks in Niagara R. and L. Ontario	DIV OR ORG ECD
KEY WORDS	Toxic Substances, Niagara River, Lake Ontario	SEC'N OR GRP OPROPS
STUDY LEADER	Kaiser, K.L.E. TEL: 637-4244	PAE 4200
TEAM MEMBERS	M.E. Comba, in collaboration with OPATHS and R. Kaminisky (U. Indiana)	DATE 82/2/1
ECS PROGRAM	M.R.C. - Toxic Substances	
ACTIV ELEM	Toxic Substances	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

Analysis of water (headspace), sediment and fish samples from the Niagara River system and Lake Ontario by GC and GCMS will be undertaken to determine sources, distribution, and sinks of contaminants.

Relevance:

This study is part of "Operation Niagara," justification for which has been demonstrated elsewhere, in particular, a federal IJC report on Pollution in the Niagara River, 1981.

Work Outline:

Samples collected previously and others to be collected will be extracted, processed and analyzed for known contaminants, such as PCB's, mirex, chlorobenzenes and will also be investigated for other compounds as identified, or suspected to be present on the basis of various literature records and by investigative gas chromatography-mass spectrometry.

Preliminary investigation of one or two other field sites may be undertaken.

Reports Expected:

One on volatile analysis.

One on volatile contaminants in Niagara River/Lake Ontario water.

STUDY TITLE	Chlorinated Hydrocarbons in Sediments and Biota of the Great Lakes	DIV OR ORG ECD
KEY WORDS	Toxic Substances, Sediments, Niagara River, Lake Ontario	SEC'N OR GRP OPROPS
STUDY LEADER	Oliver, B.G. TEL: 637-4604	PAE 4200
TEAM MEMBERS	K. Bothen	DATE 82/2/1
ECS PROGRAM	M.R.C. - Toxic Substances	
ACTIV ELEM	Toxic Substances	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

To quantitate toxic PCB's and other chlorinated hydrocarbons in various compartments of the aquatic ecosystem, and to attempt to correlate the observed concentration with the physical chemical properties of the pollutants.

Relevance:

Compound specific analysis for PCB's and other chlorinated compounds (using capillary gas chromatography) should enable us to develop a much better understanding of the environmental behaviour of these pollutants. Such analysis, coupled with good sampling strategy, will also make it possible to trace sources and to study pollution history in the Great Lakes, in particular, Lakes Ontario and Erie.

Work Outline:

Using dual column capillary gas chromatographic techniques, we will quantitate individual PCB's and chlorinated compounds in water, sediments and biota. Most of the samples to be analyzed for this study year will be from the Niagara River and adjacent Lake Ontario. Some attempts will also be made to correlate the observed concentrations in the various environmental compartments with the compound's physical chemical properties such as the octanol-water partition coefficient.

Reports Expected:

One on history of chlorinated hydrocarbon contamination of Lake Ontario from the Niagara River for IAGLR (May, 1982).

One on chlorobenzene distribution in Lake Huron and Lake Ontario sediment (November, 1982).

One on bioconcentration of PCB's by Rainbow Trout (July, 82).

STUDY TITLE	Microbial Degradation of PCB's	DIV OR ORG ECD
KEY WORDS	Degradation, Bacteria, PCB's	SEC'N OR GRP OPROPS
STUDY LEADER	Baxter, R.M. TEL: 637-4506	PAE 4200
TEAM MEMBERS	Technician	DATE 82/2/1
ECS PROGRAM	M.R.C. - Toxic Substances	
ACTIV ELEM	Toxic Substances	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

To determine pathways of transformation and degradation of PCB's that may shed light on their fate in the environment.

Relevance:

It is of both scientific and practical importance to increase our understanding of the biochemical behaviour of these ubiquitous contaminants.

Work Outline:

Previous work has shown that many chlorinated biphenyls are converted by strain of bacterium into a variety of products. Several of these are intensely coloured and can undergo further photochemical transformations. I shall attempt to identify some of these compounds and their photochemical transformation products.

I have also obtained evidence that certain PCB metabolites undergo polymerization to insoluble higher molecular weight materials. I shall attempt to confirm whether such reactions do occur, and to determine what metabolites undergo such transformations, and what products are ultimately found. A 1981 workshop, proceedings, and then a book indicated that PCB's are still one of the most serious and still little understood in terms of pathways in chemicals contaminating the Great Lakes.

Reports Expected:

One on aspects of microbial PCB metabolism. (Dec.)

STUDY TITLE	Bacterial Degradation of Organic Environmental Contaminants	DIV OR ORG ECD
KEY WORDS	Toxic Substances, Degradation, Toxicity, Bacteria	SEC'N OR GRP OPROPS
STUDY LEADER	Liu, D. TEL: 637-4576	PAE 4200
TEAM MEMBERS	K. Thomson, K. Kwasniewska, K. Kaiser	DATE 82/2/1
ECS PROGRAM	M.R.C. - Toxic Substances	
ACTIV ELEM	Toxic Substances	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

1. To determine the toxicity and biodegradability of "model" chemicals and chemicals of environmental concern, particularly phenols and benzenes.
2. To carry out in situ biodegradation experiments and compare the results with laboratory studies.

Relevance:

Toxicity and biodegradability are important factors governing the fate, including bioaccumulation, of organic compounds in aquatic environments. Investigations are relevant to hazard assessment, an aspect of the Environmental Contaminants Act (ECA). Bacterial degradation is a route for removal of toxic organics from aquatic ecosystems. Chemical toxicity may affect the microbial degradation process and the operation of the food-chain in aquatic ecosystems.

Work Outline:

ECA and GLWQA Priority List substances plus some model chemicals, particularly p-substituted phenols, will be tested for bacterial degradation in cyclone fermentors and chemical toxicity by the resazurin reduction test. Test substances, at 1-10 ppm, will be examined under conditions of nutrient availability as well as the degree of oxygenation. For the chemical toxicity test, a sensitive bacterium will be used to evaluate interaction between the microorganism and the chemical toxicity. For the in situ experiments, natural river water will be used in the fermentor. The results will be compared with those from the standard testing procedures.

Reports Expected:

Two on bacterial degradation (January, 1983).
One on bacterial toxicity (December, 1982).
One on sanitary microbiology (November, 1982).

STUDY TITLE	Chemistry of Chlorinated Hydrocarbons at the Air/Water Interface	DIV OR ORG ECD
KEY WORDS	Toxic Substances, Surface Films	SEC'N OR GRP OPROPS
STUDY LEADER	Platford, R.F.	TEL: 637-4252 PAE 4200
TEAM MEMBERS	D. Sutherland	DATE 82/2/1
ECS PROGRAM	M.R.C. - Toxic Substances	
ACTIV ELEM	Toxic Substances	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

To measure the partitioning and transport of selected hydrocarbons (MMBT, DDT, Lindane and HCB) in and through the surface layer on small lakes and rivers.

Relevance:

The surfaces of natural bodies of water are the boundaries through which all contaminants must pass from the water to either the sediment or the air. This study is concerned with transport across, and storage in, the air/water interface.

Work Outline:

A measurement of the transport of a few representative hydrocarbons from water, through the air/water interface, and into the air. Measurement of the partition coefficients planned in FY 81/82 is essentially complete.

To measure vapour pressures of a few selected hydrocarbons (MMBT, DDT, Lindane and HCB) and to combine these with solubilities already determined to calculate Henry's Law constants. This constant is one of the components governing transport of dilutes from water into the air.

Possible involvement in a study of Garrow Lake; N.W.T. (with OSS).

Reports Expected:

One on geochemistry of Arctic saline lake.

One on method of estimating transport from water to air. (July)

One on enhanced partitioning of halogenated compounds in surface films. (May)

STUDY TITLE	Contaminant Toxicity Degradation by Yeasts and Fungi	DIV OR ORG ECD
KEY WORDS	Toxic Substances, Degradation, Toxicity, Yeasts	SEC'N OR GRP OPROPS
STUDY LEADER	Kwasniewska, K. TEL: 637-4576	PAE 4200
TEAM MEMBERS	K.L.E. Kaiser, D. Liu	DATE 82/2/1
ECS PROGRAM	M.R.C. - Toxic Substances	
ACTIV ELEM	Toxic Substances	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

1. To explore the feasibility of using eukaryotic microorganisms (fungi, yeast and actinomycetes as indicators of the toxicity and biodegradability of organic compounds; 2. To investigate the interaction between the chemical toxicity and such microorganisms; 3. To compare the experimental results with those derived from the bacterial cultures.

Relevance:

Information from the study of toxicity and biodegradability are essential for the assessment of the environmental impact of existing and new chemicals to the aquatic ecosystem. The eukaryotic microorganisms occupy an important position at the initiation of the food chain in the aquatic ecosystem, because of their abundant distribution in soil and the aquatic environment. The majority of these microorganisms are known to possess extracellular enzymes which give them advantage over bacteria for degrading higher molecular weight organic compounds. Only limited information is available concerning their biodegradation potential towards organic contaminants.

Work Outline:

Phenol derivatives identified under the Environmental Contaminants Act and the Great Lakes Water Quality Agreement plus some model chemicals will be tested for their toxicity to and biodegradability by the eukaryotic microorganisms. Shaker culture technique, turbidity measurement, Warburg oxygen uptake, C.F.U. count, and microscopic examination will be used to evaluate the interaction between the microorganisms and the test chemicals. However, some modification of these techniques may be required due to the growth nature of such microorganisms.

Reports Expected:

- One on biodegradation (July, 1982).
- One on toxicity (January, 1983).

STUDY TITLE	Bioavailability of Organic Contaminants in Sediments	DIV OR ORG ECD
KEY WORDS	Bioavailability, Organic Contaminants, Sediments	SEC'N OR GRP OPROPS
STUDY LEADER	Oliver, B.G. TEL: 637-4604	PAE 4200
TEAM MEMBERS	Term Technician	DATE 82/2/1
ECS PROGRAM	M.R.C. - Toxic Substances	
ACTIV ELEM	Toxic Substances	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

To measure the portion of sediment organic contaminants (e.g., PCB's, chloro-benzenes) which is available to the biological community living in the sediment or near the sediment-water interface in Great Lakes sediments.

Relevance:

The presence of persistent organic contaminants in Great Lakes sediments is well documented. It is important to find out what portion of this material is readily available to the biological community and what portion has, in effect, been removed from the system by association with the sediments

Work Outline:

The portion of sediment organic contaminant which is soluble in synthetic lakewater and synthetic solutions simulating digestive components of biota (e.g., oligochaete worms) will be compared with the analysis of total organic contaminants measured by exhaustive sohxllet extraction. If the biologically-available material is significantly less than the total material, simple extraction methods will be developed for measurement of the bioavailable component.

Reports Expected:

New Study 1982/83.

STUDY TITLE	Organochlorine Contaminants in Surface Microlayers of the Niagara R.	DIV OR ORG ECD
KEY WORDS	Toxic Substances, Surface Films, Niagara River, LRTAP	SEC'N OR GRP OPROPS
STUDY LEADER	Platford, R.F. TEL: 637-4252	PAE 4200
TEAM MEMBERS	R.J. Maguire (Inorg Sect.) Vacant (EG; from LRTAP)	DATE 82/2/1
ECS PROGRAM	M.R.C. - Toxic Substances	
ACTIV ELEM	Toxic Substances	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

To determine whether or not a significant factor of the organochlorine contaminant load of the Niagara River is present in the surface microlayer.

Relevance:

That surface microlayers are reservoirs of lipophilic pollutants has been suggested by (a) octanol-water partition coefficients of DDT, hexachlorobenzene and lindane being greater when the octanol is in the form of a surface layer than when the volume of octanol is significant compared with water and (b) that the surface microlayer in some locations around the Great Lakes sometimes contains significant amounts of moderately lipophilic organotins compared with the total amounts contained in the whole depth of underlying water. It may be that loadings of highly lipophilic pollutants to the Great Lakes have been underestimated. The study is part of Operation Niagara, justification for which is described in an IJC report (1981).

Work Outline:

Samples of surface microlayer (by glass plate and hydrophobic filter) subsurface water and air over the surface will be taken on an occasional basis from various locations in the Niagara River, Lake Erie and Lake Ontario. The samples (not exceeding 50 in FY 82/83 will be extracted and submitted to WQ Lab for analysis for 15 chlorocarbons and PCB's.

Reports Expected:

New Study in 1982/83.

STUDY TITLE	Role of Suspended Solids in Benthos Uptake of Organics, Niagara R. Mouth	DIV OR ORG ECD
KEY WORDS	Niagara River, Lake Ontario, suspended solids, sediments, benthos, toxic organics, accumulation	SEC'N OR GRP OPATHS
STUDY LEADER	Fox, M.E. TEL: 637-4244	PAE 4200
TEAM MEMBERS	J. Carey, J. Metcalfe, H. Huneault, L. Coletta, R. Tkacz	DATE 82/2/1
ECS PROGRAM	M.R.C. - Toxic Substances	
ACTIV ELEM	Toxic Substances	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

To examine the contribution of different fractions of Niagara River suspended solids and resuspended sediments to the contaminant load of toxic organic substances in Lake Ontario sediments and biota.

Relevance:

Previous studies have established the Niagara River as a major contributor of toxic loading to Lake Ontario. Uptake of these substances by benthos may comprise a significant route by which Lake Ontario commercial and sport fisheries become contaminated. Toxic substances are a top priority in ECS.

Work Outline:

Studies on the distribution of toxic organics on suspended solids in the Niagara River and bioaccumulation in Lake Ontario biota commenced in 1981 will continue. Samples will be collected from previously selected sites between April and October.

The fate of toxic organics in the aqueous phase will be studied in a collaborative effort with APSD by defining and sampling the Niagara River plume in Lake Ontario. Water samples will be collected along six transects and analysed by a rapid method for selected organic contaminants. At the same time the plume will be defined by continuous measurements of conductivity, optical transmission and other physical parameters.

Reports Expected:

One on relationships of organic contaminants in suspended solids and benthos of Niagara R. and L. Ontario, IAGLR (May, 1982).

STUDY TITLE	Toxic Organic Substances in Precipitation	DIV OR ORG ECD
KEY WORDS	Toxic Substances, LRTAP, Precipitation	SEC'N OR GRP OPATHS
STUDY LEADER	Strachan, W.M.J. TEL: 637-4222	PAE 4200
TEAM MEMBERS	Strachan, W.M.J.; Huneault, H.	DATE 82/2/1
ECS PROGRAM	M.R.C. - Toxic Substances	
ACTIV ELEM	Toxic Substances	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

To identify organic substances in rainfall collected using automated wet deposition, organic samplers.

Relevance:

Transport and intercompartmental transfer of toxic chemicals is a major aspect in understanding their pathways. There are no "integrators" identified which could be employed for identifying new contaminants in the atmosphere. It should be established whether existing methodology has any probability of providing this. Atmospheric deposition of toxic chemicals is noted under several DOE programs and mandates: 1. ECD research priority area; 2. toxic substances - pathways and impacts (this is indicated in the 1982-7 ECD Strategic Plan as the recipient of new resources with the highest priority rating); 3. LRTAP and GLWQP - both programs have indicated a strong interest in deposition of atmospheric organic compounds.

Work Outline:

A new teflon-lined, wet deposition sampler was constructed in 1980-1 using funds from ECCF. This is being evaluated as to its utility as a surveillance tool. Some effort will be expended in ensuring the use of this sampler in CANSOC and other programs. Three samplers will be used to collect rain samples from two basic areas - an urban, industrialized area (Burlington-Hamilton-Toronto) and a remote area which is relatively unaffected by prevailing air movements from industrialized areas (northern Ontario). Samples will be collected using an XAD-2 column attached to the sampler. These will be examined using capillary GC-MS and emphasis will be on non-organochlorine substances. Triplicate samples will be collected at each location.

Reportes Expected:

One on data collected to date, to appraise sampler performance. (Aug.)

STUDY TITLE	Sediment-Water Partitioning of Toxic Organic Substances	DIV OR ORG ECD
KEY WORDS	Sediments, Partitioning, Toxic Substances, Lake Ontario	SEC'N OR GRP OPATHS
STUDY LEADER	Strachan, W.M.J. TEL: 637-4222	PAE 4200
TEAM MEMBERS	Strachan, W.M.J.; Huneault, H.	DATE 82/2/1
ECS PROGRAM	M.R.C. - Toxic Substances	
ACTIV ELEM	Toxic Substances	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

To determine the sediment-water sorption constants for known persistent contaminants.

Relevance:

Sorption behaviour in one of the basic properties of a substance which governs its fate and behaviour in the environment. It is required in any and all current mathematical models of environmental exposure of chemicals.

In the case of PCBs, the relevant constant is not available, other substances, established as Great Lakes contaminants (lindane, α -BHC, mirex, 2,3,7,8-TCDD) also have no reliable constants reported in the literature.

Work Outline:

Lake Ontario sediment will be collected and employed in the sorption evaluation. Large samples from an area with high and low organic content will be employed to minimize substrate variability. The influence of preservation techniques (freeze-drying, refrigeration and deep freezing will be examined as will the effect of grain size. Factors as outlined will be investigated at several temperatures, agitation rates, and ionic strengths. Where possible, the principles and practices of the OECD test guideline will be employed.

Reports Expected:

One on calculation of environmental distribution of new chemicals.
One on analysis of pesticides in water (Book Chpt.).
One on Exposure in Hazard Assessment (Co-Edit). (July)

STUDY TITLE	Accumulation and Effects of Contaminants in Aquatic Biota	DIV OR ORG ECD
KEY WORDS	Hirudinea, bioaccumulation, toxic organics, Grand River, Canagagigue Creek, fish, early development	SEC'N OR GRP OPATHS
STUDY LEADER	Metcalfe, J. TEL: 637-4222	PAE 4200
TEAM MEMBERS	J. Carey, M. Fox, P.D.F., R. Tkacz, L. Coletta (also includes biologist from Nat. Mus. and G.R.C.A.)	DATE 82/2/1
ECS PROGRAM	M.R.C. - Toxic Substances	
ACTIV ELEM	Toxic Substances	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

1. To determine the accumulation rates and effects of contaminants in fish eggs and larvae under field conditions.
2. To evaluate the potential of freshwater Hirudinea as indicators and accumulators of synthetic organic contaminants.

Relevance:

Toxic substances have been identified as the immediate top priority for both the Department and ECD. Investigations into the characteristics of contaminants and their pathways and fate in the aquatic environment are specifically referred to.

Work Outline:

1. Conduct studies on rainbow trout, white sucker, and common shiner eggs and larvae at fish hatchery sites on Canagagigue Creek.
2. (i) Preliminary analysis of levels and types of contaminants in Hirudinea from several regions of Canada.
(ii) Initiate study of pollution ecology of Hirudinea using the Grand River Watershed.

Reports Expected:

New Study in 1982/83.

STUDY TITLE	Pathways and Effects of Organics in Experimental Freshwater Ecosystems	DIV OR ORG ECD
KEY WORDS	Eurasian Milfoil, 2,4-D, 2,4-DCP, Ecosystem, Accumulation, Hexachlorobenzene, Trifluormethylnitrophenol	SEC'N OR GRP OPATHS
STUDY LEADER	Scott, B.F.	TEL: 637-4225 PAE 4200
TEAM MEMBERS	E. Nagy, J. Hart, S. Painter, J. Wood, M. Charlton, B. Dutka, A. Niimi, M. Diehman, G. Mackie, W. Taylor, J. Carey, M. Fox	DATE 82/2/1
ECS PROGRAM	M.R.C. - Toxic Substances	
ACTIV ELEM	Toxic Substances	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

1. To determine the long-term fate of 2,4-D in a pond ecosystem (to be concluded).
2. To ascertain the fate of TFM in a pond system (to be initiated).
3. To ascertain the short and long-term fate and impact of aminocarb in a pond system (to be initiated).

Relevance:

Based on justifications cited in earlier forecasts, the long-term accumulation of 2,4-D in sediments and fish will be determined with more sensitive instrumentation. The lampreyicide TFM has been well researched in flowing waters, but very little is known of its fate when it reaches larger bodies of water such as lakes. This study should provide significant details to complete earlier studies. More knowledge is needed on the pathways and impacts of this chemical in aquatic environments.

Work Outline:

1. All ponds will be sampled in May and June for residual amounts of 2,4-D and 2,4-DCP if ponds have less than 1×10^{-9} g/l sediment.
2. TFM will be added in late June to one or two ponds. A monitoring of water column will be carried out on a regular basis.
3. (i) Aminocarb in one of its formulations will be added to the ponds in the ice-free period of 1982.
(ii) Water quality samples (alkalinity, NH_3 , NO_3^- , TKN, Fil P, Unfil. P., SO_4^- , Ca^{++} , DOC, Des, Part C+N) zooplankton, phytoplankton, periphyton, bacteria, sediment, and protozoa will all be collected in a regular basis. Fish and other biota will be examined for the chemical.

Reports Expected:

Three on fate of oil fate in ponds. (June)
One on 2,4-D fate in ponds. (Dec.)
One on 2,4-D analytical methodology. (April)

STUDY TITLE	Accumulation/Degradation of Organic Contaminants in Fluvial Systems	DIV OR ORG ECD
KEY WORDS	Toxic Substances, Fluvial Systems, Degradation, Bioaccumulation.	SEC'N OR GRP OPATHS
STUDY LEADER	Carey, J. TEL: 637-4693	PAE 4200
TEAM MEMBERS	M. Fox, J. Metcalfe, R. Tkacz, L. Coletta	DATE 82/2/1
ECS PROGRAM	M.R.C. - Toxic Substances	
ACTIV ELEM	Toxic Substances	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

1. Continue studies of contaminants in the Canagagigue Creek ecosystem and attempt to extrapolate to other fluvial systems in Canada.
2. Continue laboratory studies on the mechanisms of accumulation and degradation of contaminants.

Relevance:

Toxic substances have been identified as the immediate top priority for both the Department and ECS. Investigations into the characteristics of contaminants and their pathways and fate in the aquatic environment are specifically referred to.

Work Outline:

- 1.a) Conduct laboratory evaluation of the uptake of contaminants by periphyton and compare results with field results from Canagagigue.
- b) Initiate study of the fate of chlorophenols in Prairie streams in collaboration with the Winnipeg detachment, NWRI and WQB, W & N Region.
- 2.a) Continue calculations of electron densities in chlorophenols and chlorobenzenes and determine routes of degradation of these compounds in Hirudinea.
- b) Continue studies of photochemistry of contaminants to identify important routes of environmental photooxidation.
- c) Continue studies to determine the fate of the lampreycide TFM in aquatic ecosystems.

Reports Expected:

Two on fate of contaminants in Canagagigue Creek. (Sept.)
One on TFM degradation in streams.

STUDY TITLE	Chemical Speciation and Bioavailability of Toxic Elements	DIV OR ORG ECD
KEY WORDS	Availability, mobility, leachability, transport chemical forms, speciation, trace elements	SEC'N OR GRP INORGS
STUDY LEADER	Lum, K.R. TEL: 637-4251	PAE 4200
TEAM MEMBERS	One research assistant	DATE 82/2/1
ECS PROGRAM	M.R.C. - Toxic Substances	
ACTIV ELEM	Toxic Substances contaminants	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

To determine the chemical forms and potential availability of trace elements in the environment and the factors regulating their speciation, distribution and transport.

Relevance:

In order to assess the degree of hazard to biotic systems, including man, posed by trace elements, data are needed on their chemical forms and potential availability. Determination of elemental concentrations provides data on actual environmental exposure. Also, determination of the elemental chemical forms yields information on physical-chemical properties which regulate their fate and distribution and hence the potential for exposure to organisms.

Work Outline:

1. Collection of water, suspended sediment and sediment cores from the Western Basin of Lake Ontario (1st half of FY 1982-83).
2. Literature search and method evaluation for the less well-studied elements, e.g., Be, Ag, As, Se (2nd and 3rd quarters 1982-83).
3. Chemical extractions, analyses, experimental work on electrochemical separation of labile and non-labile chemical species (3rd and 4th quarters).
4. Collection and analysis of street dusts and airborne particulates (2nd and 3rd quarters).
5. Analysis of acid-stressed soils (Turkey Lakes Watershed).
6. Report writing.

Reports Expected:

One on partitioning of trace metals in Lake Ontario. (June)
One on transport of elements in the lower Niagara R. (Aug.)
One on availability of metals and phosphorus in Toronto Harbour.

STUDY TITLE	Hydrogeochemical Responses of Turkey Lakes Watershed to Acid Rain	DIV OR ORG ECD
KEY WORDS	Acid rain, groundwater, geochemistry, ionic budget, LRTAP	SEC 'N OR GRP INORGS
STUDY LEADER	Jeffries, D.S. TEL: 637-4252	PAE 4300
TEAM MEMBERS	R. Semkin, B. Gilles, D. Wood, Technical Operations Support	DATE 82/2/1
ECS PROGRAM	M.R.C. - LRTAP	
ACTIV ELEM	Long Range Transport of Airborne Pollutants - Aquatic	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

To quantify the hydrogeochemical response of the Turkey Lake Watershed to acidic precipitation using a mass balance approach. The study will focus on determining a) the "dose response"-relationship for this acid susceptible basin and b) the most important geochemical mechanisms and/or interactions controlling the relationship. The Turkey Lakes Watershed is a series of acid susceptible basins located in a northern hardwood forest in Algoma. Relevance: Relevant to an objective, established by the LRTAP Steering Committee, to determine the mechanisms which control the response of aquatic ecosystems to long-range transport (deposition) of air pollutants. Work Outline:

The study site is the Turkey Lakes Watershed, north of Sault Ste. Marie where the following will be carried out: 1. Continue quantitative year-round measurement of hydrological budget for the sub-basins within the watershed. 2. Continue quantitative year-round measurement of appropriate chemical constituents of precipitation (rain and snow), lake and stream waters from the various sub-basins. 3. In cooperation with NHRI, assess the importance of groundwater flow to the hydrological and chemical budgets of the watershed. 4. Calculate the appropriate budgets from data collected in FY's 81/82 and report. 5. From the budgets, describe the movement of selected chemical constituents through the various components of the watershed. 6. Compare the response of the Turkey Lakes Watershed to others being monitored in North America.

Reports Expected:

Data report on stream and lake chemistry (August, 1982).
Data report on stream chemical loading (November, 1982).
One on bedrock composition in the watershed (October, 1982).

STUDY TITLE	Heavy Metal Methylation Processes in the Aquatic Environment	DIV OR ORG ECD
KEY WORDS	Methylation, biotransformation, toxicity, lead, tin, environments aquatic	SEC'N OR GRP INORGS
STUDY LEADER	Chau, Y.K. TEL: 637-4707	PAE 4200
TEAM MEMBERS	G.A. Bengert, P.T.S. Wong (GLBL) A.J. Carty (Waterloo University)	DATE 82/2/1
ECS PROGRAM	M.R.C. - Toxic Substances	
ACTIV ELEM	Toxic Substances	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

1. Study pathways of and factors affecting tin methylation in aquatic ecosystem.
2. Investigate the occurrence of R_3Pb^+ and R_2Pb^+ compounds in aquatic ecosystems.

Relevance and Work Outline:

1. There is widespread usage of organotins but little is known of their environmental fate. Studies of the pathways of methylation of Sn and organotin compounds are relevant to the Environmental Contaminants Act. Investigations will be carried out to establish the pathways of methylation by reacting Sn(II). Sn(IV) compounds with methylcarbonium, and carbonion donors using highly sensitive and specific techniques.
2. A contract in collaboration with R.J. Maguire and P.T. Wong (GLBL) will survey the occurrence of methy- and butyltin derivatives in environmental samples, collected at sites associated with organotin usage.
3. Dialkyllead and trialkyllead species have been shown to be degradation products of tetraalkyllead or intermediate products of the methylation sequence. No information is available about their concentrations in fish and environmental samples because of the lack of a specific method for their analyses. We will modify the peralkylation technique for alkyltin to analyse alkyllead and examine the occurrence of these species in aquatic environmental samples.
4. Metal toxicity is closely related to complexing capacity of water. Its quantitative biological significance is yet to be assessed and effort will be made to study biological responses of metal(s) in media of various complexing capacity and of the same complexing capacity but with different organic ligands.

Reports Expected:

- One on organotin compounds in Ontario lakes.
- One on method of organotin analysis for water.
- One on SAR of organotins to algae.

STUDY TITLE	Fate of Organotins in Aquatic Systems	DIV OR ORG ECD
KEY WORDS	Organotins, butyltins, bis(tri-n-butyltin) oxide, persistence, fate, sediments, algae, fish, water	SEC'N OR GRP OPROPS
STUDY LEADER	Maguire, R.J. TEL: 637-4225	PAE 4200
TEAM MEMBERS	Technician to be hired, D. Liu, P. Wong	DATE 82/2/1
ECS PROGRAM	M.R.C. - Toxic Substances	
ACTIV ELEM	Toxic Substances	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

To determine the persistence and fate of bis(tri-n-butyltin) oxide (TBTO) in aquatic systems, to develop an analytical method for dibutyltin diisooctylmercaptoacetate (DDOM), to complete a survey for organotins in the Great Lakes basin and to assess the potential importance of surface water microlayers as reservoirs of organotins and other pollutants.

Relevance:

Organotins are toxic chemicals which are used extensively as polyvinylchloride heat and light stabilizers, catalysts and biocides. Little is known of their fate in water; for this reason, organotins are on Canada's Environmental Contaminants Act Category III list (information required on fate and toxicity). A detailed memorandum on uses, toxicity, analysis and environmental occurrence of organotins accompanies the 79/80 forecast for this study.

Work Outline:

1. Finish microbial transformation of TBTO;
2. Finish algal accumulation of TBTO;
3. Develop an analytical method for DDOM in water, sediment, fish and algae;
4. Finish all analyses (surface microlayer, subsurface water and sediment) from the field survey for organotins in the Great Lakes basin;
5. Assess the importance of the surface microlayer as a reservoir of organotins and other pollutants;
6. Analyze fish from selected Great Lakes sites for organotins;
7. Select an appropriate field site for in-depth investigation of the persistence and fate of organotins;
8. If a proposal to TCMP/GLWQP is accepted, initiate a contract to compile information on organotins in water, sediment, fish and algae at various sites across Canada.

Reports Expected:

- One on analytical method for butyltin in sediment and biota. (Oct.)
One on occurrence of butyltin in the Great Lakes Basin. (Jan.)

STUDY TITLE	Heavy Metal Chemodynamics in the Niagara River and Plume	DIV OR ORG ECD
KEY WORDS	Metals, sediments, suspended solids, phytoplankton Niagara River	SEC'N OR GRP INORGS
STUDY LEADER	Mudroch, A. TEL: 637-4389	PAE 4200
TEAM MEMBERS	A. Mudroch, NWRI M. Munawar, GLBL	DATE 82/2/1
ECS PROGRAM	M.R.C. - Toxic Substances	
ACTIV ELEM	Toxic Substances	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

To investigate the changes in sediment characteristics, concentration of sediment associated metals and their potential availability to phytoplankton with the distance from the outfalls located in the Niagara River.

Relevance:

The nearshore zone at the mouth of the Niagara River has been designated by the GLWQB a few times in the past as a problem area. A number of industrial discharges to the Niagara River contribute to the pollution of water, suspended solids and sediments. Differential response of various constituents of a phytoplankton community to pollutants may identify the role of the pollutants in the food chain. Any impact on the phytoplankton size fraction which is further grazed by zooplankton will affect the food chain.

Work Outline:

1. Field Work - Based on 1981-82 results, sediment, water, plankton and suspended solids will be sampled at selected stations in Niagara River and Western Basin of Lake Ontario from April to October 1982. In situ bioassays will be carried out with plankton in Niagara River.
2. Laboratory Work - Determination of major elements and metals in all samples, and of organic pollutants in selected samples. Autoradiography of algal assemblages to investigate the impact of pollutants. Investigation of morphological changes and metal uptake by plankton, using SEM and TEM-EDX system.

Reports Expected:

One on chemodynamics of metals in Niagara R. plume, IAGLR (May, 1982).
One on organic contamination in western Lake Ontario sediment, IAGLR (May, 1982).
One on characteristics of suspended solids in western Lake Ontario.

STUDY TITLE	Geochemical Controls of Aquatic System Responses to Acid Rain	DIV OR ORG ECD
KEY WORDS	Acid rain, contaminants, buffering capacity, ionic budget, humic acids	SEC'N OR GRP INORGS
STUDY LEADER	Jeffries, D.S. TEL: 637-4252	PAE 4300
TEAM MEMBERS	B.G. Oliver, G. Slawych, R. Semkin	DATE 82/2/1
ECS PROGRAM	M.R.C. - LRTAP	
ACTIV ELEM	Long Range Transport of Airborne Pollutants - Aquatic	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

To develop an understanding of the geochemical response of drainage basins and associated lakes to acid precipitation and atmospheric loading of other contaminants. Investigation will focus on delineating the important factors or processes controlling both short and long-term acidification of the basins.

Relevance:

Long-range transport of atmospheric pollutants is causing acid precipitation to fall throughout much of southern Ontario, Quebec and the Maritime Provinces. Many of the lakes and rivers within the zone of acid precipitation are poorly buffered and are becoming acidified to the extent that they will no longer support "normal" aquatic life. In particular, the rate of acidification is poorly understood.

Work Outline:

1. Work will continue on identifying and quantifying the major (carbonate) and minor (organic acids) buffering constituents in water, sediment, soils, and biota in the Turkey Lakes Watershed.
2. Work will begin to investigate the influence of acidic deposition on the material budget(s) for the Turkey Lakes Watershed(s). Deviations of annual (perhaps) seasonal) mass balances away from that expected for a "non-acid-impacted" basin will yield information on the factors controlling the degree and rate of acidification in the long term.
3. Work will begin to investigate factors controlling short term acidification of lakes and associated basins. This will include a) assessment of snowpack storage and release of acid and other contaminants in the Turkey Lakes Watershed, and b) variation in stream and lake pH during the spring runoff period.
4. Development of greater liaison with MNR basin studies at Dorset, Ontario (the other major watershed mass balance study in Ontario).

Reports Expected:

- One on changes in 1981 stream and lake acidity in Turkey Lakes Watershed (July '82).
One on snowpack composition in Turkey Lakes Watershed (Feb. '83).

STUDY TITLE	Aquatic Regime Acidification Models	DIV OR ORG ECD
KEY WORDS	ACID RAIN, ENVIRONMENTAL SIMULATION, LRTAP	SEC'N OR GRP INORGS
STUDY LEADER	Lam, D.C.L. TEL: 637-435	PAE 4300
TEAM MEMBERS	D.S. Jeffries	DATE 1/5/82
ECS PROGRAM	M.R.C.- LRTAP	
ACTIV ELEM	Long Range Transport of Airborne Pollutants - Aquatic	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE**GOALS:**

1. To develop a modelling capability to simulate the hydro-geological responses of the Canadian regime to the external loading due to LRTAP by review, improvement, extension and implementation of deterministic models of lake and watershed acidification.
2. To assess the environment response of the Canadian aquatic regimes to LRTAP stress by applying modelling approaches in loading control strategies and scenarios.

RELEVANCE:

The primary requirement of the Canada-U.S. Memorandum of Intent concerning Transboundary Air Pollution is the specification of ecosystem tolerance and response to LRTAP stresses. The Modelling efforts are necessary to synthesize the information into comprehension regime response simulation.

WORK OUTLINE:

- a) To evaluate available hydro-geochemical acidification and water quality models and to develop the most appropriate model to include the pH effects on nutrients and primary production of planktons and to modify existing groundwater transport model to accommodate the pathways of major ions affecting the alkalinity and acidity of the aquatic ecosystem (by March 1983).
- b) To integrate watershed data to pinpoint the pathways leading to surface or groundwater systems and to calibrate known chemical equilibrium equations for the carbon, sulphur and nitrogen cycles for these systems (by March 1984);
- c) To continue to upgrade the model components, to feed back to scientific experimental projects and to react to LRTAP program requirements following completion of each stage of model development.

STUDY TITLE	Simulation of toxic contaminants fate in lake Ontario	DIV OR ORG ECD
KEY WORDS	TOXIC SUBSTANCES, NIAGARA RIVER, LAKE ONTARIO, SEDIMENTS, MODELS	SEC'N OR GRP INORGS
STUDY LEADER	Halfon, E. TEL: 637-4743	PAE
TEAM MEMBERS	J. Maguire(0.05)	DATE 1/5/82
ECS PROGRAM		
ACTIV ELEM		

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

GOALS: To understand pathways and fate of organic contaminants in the Niagara River/Lake Ontario area by simulation modelling. To reduce scientific uncertainties and to obtain a predictive capability based on physical/chemical properties of the contaminants. To set up a data base of physical/chemical properties and reaction rates useful for modeling and for use by scientists in the Environmental Contaminants Division. To analyze sediments data with diagenetic models to quantify the water sediment interactions of various chemicals. To analyze sediments trap data collected by M. Charlton for the same purpose. To assist in the development of data base and concentrations of organic contaminants in the Great Lakes. This data base is being organized within the Data Management Section.

RELEVANCE: Sorption of contaminants by particulate matter (mineral or organic, suspended or bottom sediments) is a major factor controlling their pathways in the basic data (1981/82 studies ECD-3220, 3222, 3224, 3225). Incorporation of these data in a modeling framework will help in obtaining a prediction capability. A data base provides a basic framework for collection and storage in a form suitable for modeling. This study will be party of a large multidisciplinary interdivisional research study in the Niagara River/Western Lake Ontario region.

WORK OUTLINE: A data base for physical/chemical properties of organic contaminants will be developed within the EXAMS framework. Field scientists will therefore be able to run in real time simulation models to assess the relevance of their data within an ecosystem approach. The data base will be confidential until results can be shared with the scientific community at large. Thus a modelling activity can take place before data are published. A simulation model for the Niagara River/Western Lake Ontario region will be developed in conjunction and in support of the data base. Diagenetic models will be run to assess the behavior of contaminants in the sediments after deposition and possibly to compute rates of desposition. This exercise should also provide rates of exchange between water and sediments when stimulation results will be coupled with the analysis of the sediment trap experiments. A technical data report on the usage of toxic contaminants data base and a scientific paper on diagenetic and bioturbation models will be produced by March 1983.

STUDY TITLE	Trends in Radioactive Contaminants in the Great Lakes	DIV OR ORG ECD
KEY WORDS	Radioactivity, Great Lakes surveillance	SEC'N OR GRP RANUCS
STUDY LEADER	Durham, R.W. TEL: 637-4289	PAE 1103
TEAM MEMBERS	S.R. Joshi, S. Livermore, E.A. Kokatich	DATE 82/2/1
ECS PROGRAM	Canada-U.S. and Interprovincial Waters	
ACTIV ELEM	Surveillance/Monitoring	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

To determine trends of concentrations of radionuclides in open waters of the Great Lakes and at selected WQB sampling stations across Canada.

Relevance:

Annual data to be supplied to IJC Surveillance Subcommittee to fulfill DOE obligations to GLWQA Surveillance Plan and detect any impact on the environment of nuclear power development.

Work Outline:

Open water samples (50L) from all Great Lakes except Lake Michigan will be collected at several stations in each lake by Technical Operations Division staff during NWRI and GLBL surveillance cruises. Samples from Lake Michigan will depend on USEPQ Region V receiving sufficient funding to operate their vessel. Fish samples will be provided by GLBL for bioconcentration measurements. Annual composite samples from 13 WQB stations across Canada will be analysed for radionuclides.

Reports Expected:

One on 1981 surveillance data (Aug. 1982).

STUDY TITLE	Radium-226 Pathways - Port Granby Waste Management Site to Lake Ontario	DIV OR ORG ECD
KEY WORDS	Radioactivity, waste management, groundwater	SEC'N OR GRP RANUCS
STUDY LEADER	Durham, R.W. TEL: 637-4289	PAE 4200
TEAM MEMBERS	A.G. Bobba, J. FitzGerald, S.R. Joshi	DATE 82/2/1
ECS PROGRAM	M.R.C. - Toxic Substances	
ACTIV ELEM	Toxic Substances	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

To determine the extent of ^{226}Ra transport to Lake Ontario by groundwater flowing under the lake bottom from the Eldorado Nuclear Ltd. radioactive waste burial site.

Relevance:

Information obtained on groundwater flow rates, hydraulic pressures and extent of ^{226}Ra contamination will be used to calibrate NWRI model of waste management site leaching by groundwater. Will extend application of model to contaminant releases in general from waste management sites. Data will be useful in planning decommissioning of site by AECB and ENL.

Work Outline:

The most probable area for ^{226}Ra movement has been delineated during 1981. Piezometers have been installed at selected points in this area in November to measure hydraulic pressures and allow groundwater samples to be collected for ^{226}Ra analysis in spring 1982. Results of these analyses will be fitted using the groundwater contaminant model.

Reports Expected:

One on transport of contaminants by groundwater at Port Granby.

STUDY TITLE	Radionuclide Pathways in the Niagara R. and L. Ontario	DIV OR ORG ECD
KEY WORDS	Sediments, radioactivity, Niagara River, Lake Ontario	SEC'N OR GRP RANUCS
STUDY LEADER	Joshi, S.R. TEL: 637-4573	PAE 4200
TEAM MEMBERS	R.W. Durham, E.A. Kokotich, S. Livermore, J.A. FitzGerald	DATE 82/2/1
ECS PROGRAM	M.R.C. - Toxic Substances	
ACTIV ELEM	Toxic Substances	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

1. Develop analytical techniques for measuring extremely low levels of Pu in the sediments by the end of September 1982.
2. Apply the method developed for determining the concentrations of Pu in sediment cores from Niagara River/Lake Ontario. These analyses will continue during the remainder of the FY.
3. Assess the results of these measurements using the time scale established by the ^{210}Pb , ^{226}Ra , ^{137}Cs profiles of the cores.

Relevance:

Pollution of the Niagara River has been identified as a major source of concern by the Canadian and U.S. Federal Governments, as well as those of Ontario and New York. Pu is expected to be found as a result of earlier nuclear fuel reprocessing effluents, from West Valley, NY, entering the eastern end of Lake Erie.

Work Outline:

1. Analytical techniques for measuring Pu will be developed.
2. The Pu content of several sediment samples obtained from locations in Niagara River/Lake Ontario will be determined.
3. The amount of Pu entering Lake Ontario will be computed using the sedimentary excess ^{210}Pb and ^{137}Cs profiles.

Reports Expected:

One on sedimentation rates and contamination history of western Lake Ontario, IAGLR (May, 1982).
One on sediment rates and contamination history of Bay of Quinte.

STUDY TITLE	Aquatic Pathways of Radionuclides Released by Uranium Mining	DIV OR ORG ECD
KEY WORDS	Uranium milling, Saskatchewan, radioactivity	SEC'N OR GRP RANUCS
STUDY LEADER	Joshi, S.R. TEL: 637-4573	PAE 4200
TEAM MEMBERS	Durham, R.W., FitzGerald, J.A., PDF	DATE 82/2/1
ECS PROGRAM	M.R.C. - Toxic Substances	
ACTIV ELEM	Toxic Substances	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

1. Assess the research needs and select suitable sites for field work in northern Saskatchewan and collect various samples for radiochemical analysis by the end of September 1982.
2. Commence the analyses in October, 1982 and continue during the remainder of the FY.

Relevance:

The study bears relevance to the TCMP High Profile Issues and Needs as well as to the DOE priorities in the Energy sector as outlined in the Departmental Strategic Plan. It is expected that the study will provide information on the presence of radiologically toxic elements in the aquatic environment as well as a knowledge of their actual and potential impact.

Work Outline:

Contacts will be developed with various government agencies and industry in order to accurately assess the research needs in the area. Based on the information obtained, suitable sites will be selected for field work and samples collected. The concentrations of various radionuclides present in different samples will be measured.

Reports Expected:

New Study 1982/83

HYDRAULICS DIVISION

STUDIES FOR HYDRAULICS DIVISION

STUDY LEADER

SECTION	STUDY	STUDY TITLE	STUDY LEADER
ENVIRONMENTAL HYDRAULICS			
309	*	PERSISTENT TOXIC SUBSTANCES IN URBAN RUNOFF (GLWA 1978)	MARSALEK, J.
310	*	EFFECTS OF URBAN LAND USE ON RUNOFF	MARSALEK, J.
312	*	SEWER PIPE JUNCTION	NG, H.
313	*	RIVER ICE JAMS AND FLOODING	BELTAOS, S.
314	*	ANALYSIS OF HISTORICAL DATA ON RIVER ICE BREAKUP	BELTAOS, S.
315	*	SURGES FROM ICE JAM RELEASES	BELTAOS, S.
316	*	FRAZIL FORMATION AND PROPERTIES	TSANG, G.
317	*	MODELLING OF UNDERWATER GAS PLUMES	TSANG, G.
319	*	EVALUATION, CALIBRATION AND MAINTENANCE OF FRAZIL INSTRUMENT	TSANG, G.
320	*	SUSPENDED SEDIMENT EFFECTS ON FLOW	LAU, Y. L.
321	*	SEDIMENT TRANSPORT UNDER ICE COVER	LAU, Y. L.
322	*	INVESTIGATIONS OF MIXING USING TURBULENCE MODEL	KRISHNAPPAN, B. G.
323	*	FORMATION OF MEANDERS IN NATURAL STREAMS	KRISHNAPPAN, B. G.
324	*	PREDICTION SCOURS AT RIVER CONSTRUCTIONS	KRISHNAPPAN, B. G.
325	*	MIGRATION SPEED OF DUNES	ENGEL, P.
326	*	CRITICAL SHEAR STRESS-EFFECT OF SIZE DISTRIBUTION CONT'D	ENGEL, P.
327	*	CALIBRATION OF BEDLOAD SAMPLERS	ENGEL, P.
328	*	APPLICATION OF MOBED TO LESSER SLAVE RIVER	KRISHNAPPAN, B. G.
329	*	USER'S MANUAL FOR STREAM TUBE MODEL	KRISHNAPPAN, B. G.
330	*	TASK FORCE ON RIVER MIXING	LAU, Y. L.
331	*	ICE PROBLEMS IN MILLBROOK AT KENTVILLE, N.S.	BELTAOS, S.
332	*	RIDEAU RIVER STORMWATER MANAGEMENT STUDY	MARSALEK, J.
333	*	WATERFORD RIVER BASIN - NEWFOUNDLAND	MARSALEK, J.
334	*	UNESCO MANUALS ON URBAN DRAINAGE	MARSALEK, J.
335	*	FLOW AND BEDFORM INTERACTIONS	LAU, Y. L.
ENGINEERING			
361	*	DIVISION CAPITAL PLAN - ENGINEERING	DICK, T. M.
368	*	DRAFTING SERVICES TO CCIN	FINN, W.
369	*	COMMON USER EQUIPMENT MAINTENANCE	PASHLEY, A.
370	*	METRICATION OF EQUIPMENT R AND D AND ICML UNITS	PASHLEY, A.
371	*	ADVANCEMENT OF CURRENT METERING WAVE ORBITAL MOTION SIMULATOR	SAVILE, H.
372	*	INSTRUMENT CALIBRATION MAINTENANCE LABORATORY	MOLLON, K.
373	*	PILP INVOLVEMENT/LISLE-METREX	WATSON, A. S.
374	*	PILP/INVOLVEMENT/MONITEQ	DESROSIER, R.
375	*	FLOOD FORECASTING ICE UNDERSURFACE OBSERVATION	VALDMANIS, J.
376	*	FLOOD FORECASTING ICE THICKNESS MEASURING	WATSON, A. S.
377	*	FLOOD FORECASTING FRAZIL ICE RECORDER	FORD, J. S.
379	*	ENGINEERING AND TECHNICAL SUPPORT TO OTHERS	FORD, J. S.
380	*	FIELD TAPE TRANSLATOR (SCRIBE) PART 1-SEDWG.	HARRISON, E.
381	*	RETROFIT RCM-12 CURRENT METERS - SEDWG	VALDMANIS, J.
383	*	G VAPS CABLE REDESIGN AND TEST - SEDWG	ROY, F. E.
384	*	MET PACK II, FIELD TRIALS - SEDWG	VALDMANIS, J.
387	*	WINCH FOR SURVEILLANCE PROFILING	PASHLEY, A.
388	*	SEKERKA OXYGEN PROBE (MECHANICAL) - SEDWG	ROY, F.
389	*	ENGINEERING AND TECHNICAL SUPPORT TO NHRI	FORD, J. S.
DIVISION			
318	*	EXTERNAL LABORATORY SERVICE	DICK, T. M.
358	*	DIVISION MANAGEMENT - HD	DICK, T. M.

STUDIES FOR HYDRAULICS DIVISION

SECTION	STUDY	STUDY TITLE	STUDY LEADER
*	359	DIVISION MANAGEMENT - ENSRVS	DICK, T. M.
*	360	OPEN HOUSE	DICK, T. M.
*	362	DIVISION CAPITAL PLAN - HYDRAULICS	DICK, T. M.
OFFICE	364	OFFICE SUPPORT SERVICES - HYDRAULICS	HEAD, OFFICE SERVI
*	365	OFFICE SUPPORT SERVICES - ESS	HEAD, OFFICE SERVI
SHORE PROCESSES	337	WAVE AMPLIFICATION AND DECAY AND TURBULENT MIXING	DONELAN, M.
*	338	AIR/WATER INTERACTION	DONELAN, M.
*	339	ATLANTIC REMOTE SENSING LAND-OCEAN EXPERIMENT (ARSLOE)	SKAFEL, M. G.
*	340	50 POINT MARINA	SKAFEL, M. G.
*	341	WIND-WAVE FLUME OPERATION	SKAFEL, M. G.
*	342	NEARSHORE SEDIMENT TRANSPORT	SKAFEL, M. G.
*	343	LONG POINT EVOLUTION	COAKLEY, J. P.
*	344	LONG-TERM SHORE PROCESSES AT POINTE-AUX-PINS	COAKLEY, J. P.
*	345	LABORATORY TEST OF SOIL ERODIBILITY	ZEMAN, A. J.
*	346	GEOTECHNICAL STUDY OF PORT BURWELL	ZEMAN, A. J.
*	347	NEARSHORE PROFILE CHANGES IN THE GREAT LAKES	RUKAVINA, N. A.
*	348	NEARSHORE SEDIMENT DATA SERVICE	RUKAVINA, N. A.
*	349	SHORELINE DREDGE DISPOSAL SITES	SKAFEL, M. G.
*	350	COOPERATIVE STUDY WITH THE DEPARTMENT OF PUBLIC WORKS	SKAFEL, M. G.
*	351	OIL INDUSTRY COASTAL ENGINEERING RESEARCH	BISHOP, C.
*	352	SHORE PROTECTION METHODS	BISHOP, C.
*	353	FLOATING TIRE BREAKWATER RESEARCH	BISHOP, C.
*	354	THIRD WORKSHOP ON GREAT LAKES COASTAL EROSION AND SEDIMENTATION	RUKAVINA, N. A.
*	355	NEARSHORE SEDIMENT DATA REPORTS/ATLAS	RUKAVINA, N. A.
TECHNICAL SERVICES	301	LABORATORY METHODS FOR GEOTECHNICAL ANALYSIS-MANUAL	DUNCAN, G.
*	302	SEDIMENTOLOGY-GEOTECHNICAL SERVICES	DUNCAN, G.
*	303	GRAIN-SIZE ANALYSIS BY SEDIGRAPH-WORKSHOP	DUNCAN, G.
*	304	NATIONAL CALIBRATION SERVICES	DEZEEUW, C.
*	305	MAINTENANCE	DEZEEUW, C.
*	306	REDUCING CALIBRATION RUNS FOR "PRICE" CURRENT METERS	DEZEEUW, C.
*	307	REPLACEMENT OF DATA ACQUISITION SYSTEM FOR NCS TOWING CARRIAGE	FEKY, D.
*	308	DESIGN AND TESTING OF "S" ROTOR	DEZEEUW, C.

STUDY TITLE	Laboratory Methods for Geotechnical Analysis-Manual	DIV OR ORG HD
KEY WORDS	Sediments, analysis	SEC'N OR GRP TCSRVS
STUDY LEADER	Duncan, G. TEL: 637-4230	PAE 1714
TEAM MEMBERS	K. Salisbury, Consultant, A. Zeman	DATE 82/01/20
ECS PROGRAM	Water Management Research	
ACTIV ELEM	Hydraulics	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

To complete a manual of the laboratory procedures used in the Geotechnical Laboratory at CCIW by March 31, 1983.

Relevance:

The need exists to assemble, standardize and to document methods employed in the Geotechnical Lab for scientists and technicians using the lab equipment. The procedures to be documented are:

1. X-radiography.
2. Core logging.
3. Triaxial testing.
4. Consolidation.
5. Erodibility.

Work Outline:

1. Literature survey.
2. Write manual.
3. Publish draft manual.

STUDY TITLE	Sedimentology-Geotechnical Services	DIV OR ORG HD
KEY WORDS	Sediments	SEC'N OR GRP TCSRVS
STUDY LEADER	Duncan, G. TEL: 637-4230	PAE 1714
TEAM MEMBERS	K. Salisbury, Consultant, Dr. N.A. Rukavina	DATE 82/01/20
ECS PROGRAM	Water Management Research	
ACTIV ELEM	Hydraulics	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

To respond to request for sedimentological and geotechnical samples analyses from groups outside the Hydraulics Division.

Relevance:

Expertise and specialized equipment are needed to perform these sample analyses. Requests are received from federal and provincial agencies, universities and the private sector.

List of Clients:

Department of Public Works - Port Burwell
Ontario Ministry of the Environment
University of Waterloo
Environmental Contaminants Division/NWRI
Department of Fisheries & Oceans
Aquatic Ecology Division/NWRI

Lands Directorate, CCIW
Water Quality Branch, CCIW
National Harbour Board
Great Lakes Biolimnology Laboratory
(CCIW)
Pacific Geoscience, EMR
Queen's University

The Department's cost recovery policy will be applied.

Work Outline:

1. Requests to be approved by Division Chief.
2. Analyses to be performed by trained staff.
3. Data to be checked by study leader.
4. Results of analyses to be supplied to clients in report format.

STUDY TITLE	Grain-size Analysis by Sedigraph-Workshop	DIV OR ORG HD
KEY WORDS	Instrumentation, workshop	SEC'N OR GRP TCSRVS
STUDY LEADER	Duncan, G. TEL: 637-4230	PAE 1714
TEAM MEMBERS	K. Salisbury, Constultant, N.A. Rukavina	DATE 82/01/20
ECS PROGRAM	Water Management Research	
ACTIV ELEM	Hydraulics	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

Sponsor a workshop on the use of the sedigraph analyzer as a tool in Geological Studies in the winter of 1983.

Relevance:

Measurement of fine-grain particles using a sedigraph analyzer has produced a variety of techniques and a number of mutual problems among the users in Canada and the U.S. The workshop will encourage solutions to problems and attempt to standardize techniques.

Work Outline:

1. User survey.
2. Hold workshop.
3. Publish results.

STUDY TITLE	National Calibration Services	DIV OR ORG HD
KEY WORDS	Open channel flows, streams, natural, standards, rivers, calibration, current meters	SEC'N OR GRP TCSRVS
STUDY LEADER	DeZeeuw, C. TEL: 637-4733	PAE 1605
TEAM MEMBERS	D. Fekyt, C. Bil, B. Near, G. Voros	DATE 82/01/20
ECS PROGRAM	Water Management Data	
ACTIV ELEM	Special Services	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

1. Calibration and testing of instruments for data collection programs of ECS on a continuing basis throughout the fiscal year 1982/83.
2. Calibration and testing of instruments for data collection programs for other federal and provincial government agencies, universities and the private sector on an "as required" basis during the fiscal year 1982/83.

Relevance:

The towing tank and associated equipment are the only facility in Canada specialized to calibrate water current meters. Stream flow measurements are taken for the survey of national water resources, flow and flood forecasting, the design of dams and bridges, power-generating investigations, industrial investigations and for studies in limnology and marine science.

Work Outline:

This is a continuing project. Equipment is tested in a towing tank or environmental chamber. It involves the calibration of current meters in the tank and the analysis of the performance of environmental conditions in a testing chamber, the analysis of data, the preparation of calibration certificates and the writing of performance reports.

STUDY TITLE	Maintenance: Hydraulics Laboratories	DIV OR ORG HD
KEY WORDS	Operate buildings, maintain	SEC'N OR GRP TCSRVS
STUDY LEADER	DeZeeuw, C. TEL: 637-4733	PAE 1714
TEAM MEMBERS	G. Voros, D. Fekyt, E. Nash, R. Klainka	DATE 82/01/20
ECS PROGRAM	Water Management Research	
ACTIV ELEM	Hydraulics	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

To perform maintenance on major research equipment, instruments and apparatus in the Hydraulics Research Laboratories.

Relevance:

Highly specialized and expensive installations are located in the laboratories, some of which are the only ones of their kind in Canada. Trained and highly specialized people are required to ensure that this equipment is properly maintained and ready to conduct research at all times.

Work Outline:

1. Maintain a proper preventive maintenance schedule.
2. Keep maintenance manuals up to date.
3. Perform maintenance and keep log books up to date.
4. Maintain an inventory of spare parts.
5. Supervise contractors performing maintenance.
6. Repair and maintain Water Survey of Canada current meters.

STUDY TITLE	Reducing Calibration Runs for "Price" Current Meters	DIV OR ORG HD
KEY WORDS	Calibration, open channel flows	SEC'N OR GRP TCSRVS
STUDY LEADER	DeZeeuw, C. TEL: 637-4733.	PAE 1714
TEAM MEMBERS	P. Engel, C. Bil	DATE 82/01/20
ECS PROGRAM	Water Management Research	
ACTIV ELEM	Hydraulics	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

To investigate the feasibility of reducing the number of calibration runs for the Price, Model 622AA current meter without impeding the calibration accuracy.

Relevance:

The towing tank is working a full capacity with our present person/year resources. Extra time is needed to support research and special tests. Efficiency will be improved.

Work Outline:

1. Write compute programs.
2. Evaluate historical data.
3. Perform additional tests.
4. Write progress report.

STUDY TITLE	Replacement of Data Acquisition System for NCS Towing Carriage	DIV OR ORG HD
KEY WORDS	Instrumentation, current meter, data collection	SEC'N OR GRP TCSRVS
STUDY LEADER	Fekyt, D. TEL: 637-4520	PAE 1714
TEAM MEMBERS	E. Harrison, P. Engel, C. DeZeeuw	DATE 82/01/20
ECS PROGRAM	Water Management Research	
ACTIV ELEM	Hydraulics	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

To increase current meter data collection efficiency and accuracy by replacing present obsolete data acquisition system with up to date equipment by March 31/83.

Relevance:

The electronic data acquisition system installed by Westinghouse in 1972 has reached an obsolescent point, where it is no longer practical or economical to repair the various units as they fail. In addition, the present requirement for increased accuracy of data is difficult and sometimes not possible to achieve with the existing system.

Work Outline:

1. Strike a committee to study and make recommendations.
2. Design a new data system by: a) contract
b) inhouse and consultant
3. Implement the new system.

STUDY TITLE	Design and Testing of "S" Rotor	DIV OR ORG HD
KEY WORDS	Calibration, current meter	SEC'N OR GRP TCSRVS
STUDY LEADER	DeZeeuw, C. TEL: 637-4733	PAE 1714
TEAM MEMBERS	P. Engel, G. Voros, D. Fekyt	DATE 82/01/20
ECS PROGRAM	Water Management Research	
ACTIV ELEM	Hydraulics	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

1. Design and test "S" shaped rotors to fit in frame of Price type 622AA current meter, to improve the accuracy of stream flow measurements below 80 cm/sec.
2. To report results before March 1983.

Relevance:

Requests have been received for a current meter which measures stream flow below 80 cm/sec more accurately than what is presently available. Preliminary tests with a prototype "S" rotor have shown good potential.

Work Outline:

1. Fabricate "S" rotors of various diameters.
2. Calibrate "S" rotors and compare results with Price 622AA bucket wheel.
3. Design a "clip on" device to exchange bucket wheel and "S" rotor in Price meter yoke.
4. Report results.

STUDY TITLE	Persistent Toxic Substances in Urban Runoff (GLWQA 1978)	DIV OR ORG HD
KEY WORDS	Toxic substances, pathways, pollution, urban, runoff, data collection, PCB's, pesticides, Great Lakes	SEC'N OR GRP EHS
STUDY LEADER	Marsalek, J. TEL: 637-4328	PAE 1714
TEAM MEMBERS	Physical Scientist (to be hired) Contractor	DATE 82/01/20
ECS PROGRAM	Water Management Research	
ACTIV ELEM	Hydraulics	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

1. Complete monitoring of persistent toxic substances in selected communities during the May-November period.
2. Estimate loading of persistent toxic substances in urban runoff in the Lower Great Lakes Basin by the end of the fiscal year.

Relevance:

The study has been initiated in support of the Great Lakes Water Quality Agreement 1978.

HD's involvement has been requested by DG, Ontario.

Work Outline:

1. Complete collection of samples in selected communities.
2. Establish unit loading rates.
3. Establish loads in urban runoff from communities in the basin.
4. Prepare a final report.

STUDY TITLE	Effects of Urban Land Use on Runoff	DIV OR ORG HD
KEY WORDS	Urban, runoff, land use, pollution, environmental simulation, data collection	SEC'N OR GRP EHS
STUDY LEADER	Marsalek, J. TEL: 637-4328	PAE 1714
TEAM MEMBERS	H. Ng, Research Technician	DATE 82/01/20
ECS PROGRAM	Water Management Research	
ACTIV ELEM	Hydraulics	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

1. Determine the effects of urban land use on runoff quantity and quality by the end of the FY 1982/83.
2. Collect field data on runoff quantity and quality in two test catchments, throughout the field season.
3. Analyze field data, perform computer simulations, and prepare a final report by the end of the fiscal year.

Relevance:

Effective management of urban water resources requires knowledge of the effects of land use on hydrological regime and water quality. The study represents an extension of the previous COA and PLUARG research and is relevant to ECS research priority concerning the impact of human activities on the environment.

Work Outline:

1. Install field instruments.
2. Collect rainfall and runoff data.
3. Simulate selected observed events.
4. Prepare a final report.

STUDY TITLE	Sewer Pipe Junction	DIV OR ORG HD
KEY WORDS	Hydraulics, data collection	SEC'N OR GRP EHS
STUDY LEADER	Ng, H. TEL: 637-4329	PAE 1714
TEAM MEMBERS	J. Marsalek, Technician	DATE 82/01/20
ECS PROGRAM	Water Management Research	
ACTIV ELEM	Hydraulics	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

Evaluate energy losses at sewer pipe junctions with a lateral at various angles and investigate means of reducing losses by the end of the fiscal year.

Relevance:

Sewer junctions have been identified as bottlenecks, reducing the overall capacity of sewer systems. Data on junction energy loss is needed for flow routing through junctions and for sewer design.

The study was initiated by COA and is relevant to the IWD research priority re development of runoff models.

Work Outline:

1. Fabricate two junctions (square and cylindrical) with fitting attachments and pipe matching to adopt a lateral from various directions.
2. Modified lateral head box to adjustable position.
3. Relocated manometer board.
4. Test junction with a lateral.
5. Analyse data.
6. Prepare a report.

NATIONAL WATER RESEARCH INSTITUTE

Study Plan

NO: 82-313

STUDY TITLE	River Ice Jams and Flooding	DIV OR ORG HD
KEY WORDS	Flooding, ice jams, breakup, rivers	SEC'N OR GRP EHS
STUDY LEADER	Beltaos, S. TEL: 637-4329	PAE 1714
TEAM MEMBERS	J. Wong	DATE 82/01/20
ECS PROGRAM	Water Management Research	
ACTIV ELEM	Hydraulics	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

Long Term: To document and study river ice jams and flooding with a view to improve qualitative understanding of their causes, behaviour and effects; and to quantify aspects that may be amenable to analysis. Completion date unknown at present.

Short Term: Document ice breakup in Lower Thames and Upper Grand Rivers; carry out supplementary field surveys and freeze up observations. Prepare progress report before March 31, 1983.

Relevance:

There is little understanding of ice jamming phenomena and even less with respect to engineering methods for quantitative predictions. Flooding caused by ice is a major problem in the Flood Damage Reduction Program.

Work Outline:

1. Document breakup in Thames and Grand Rivers if it occurs after March 31, 1982, (unlikely but possible).
2. Carry out hydrometric surveys under open water conditions, as needed to supplement observations of 1982 breakup.
3. Process/analyze field data and prepare progress report on preceding breakup.
4. Monitor freeze up and breakup in Thames and Grand Rivers (if, as expected, it occurs before March 31, 1983).

STUDY TITLE	Analysis of Historical data on River Ice Breakup	DIV OR ORG HD
KEY WORDS	Data, historical, rivers, ice, breakup	SEC'N OR GRP EHS
STUDY LEADER	Beltaos, S. TEL: 637-4329	PAE 1714
TEAM MEMBERS		DATE 82/01/20
ECS PROGRAM	Water Management Research	
ACTIV ELEM	Hydraulics	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

Long Term: To analyse past water stage records during spring breakup at selected gauge sites and develop frequency curves of maximum stage and backwater; to examine variations of such curves with stream type; to attempt formulation of criteria for forecasting time and flooding potential of breakup (by March 1985).

Short Term: To extend analysis to one or two additional gauges and carry out hydrometric surveys needed as supplementary information (by March 1983).

Relevance:

This study would assist the Flood Damage Reduction Program. Note that systematic statistical analysis of historical breakup data has not been, so far, undertaken in Canada.

Work Outline:

1. Carry out analysis for one or two additional gauges; provide assistance to D. Randall (WSC-Fredericton) with analysis of gauge record for Nashwaak, R., N.B.
2. Carry out hydrometric surveys.
3. Prepare progress report.

STUDY TITLE	Surges From Ice Jam Releases	DIV OR ORG HD
KEY WORDS	Rivers, surges, ice jams, flow, unsteady	SEC'N OR GRP EHS
STUDY LEADER	Beltaos, S. TEL: 637-4329	PAE 1714
TEAM MEMBERS	B.G. Krishnappan, J. Wong	DATE 82/01/20
ECS PROGRAM	Water Management Research	
ACTIV ELEM	Hydraulics	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

Long Term: To extend the current study so as to consider modelling of phenomena that occur when an ice/water surge is arrested and a new jam forms (laboratory tests will be required). Completion data; unknown.

Short Term: To calibrate existing mathematical model for releases of model ice jams in test flume; and to commence laboratory observations on re-formation of ice jams. Report on progress (by March 1983).

Relevance:

This study is pertinent to the Flood Damage Reduction Program. It would also be of value to short-term flood forecasting in cases where ice jams form upstream of populated areas.

Work Outline:

1. Calibrate existing mathematical model for releases of model james in test flume.
2. Commence laboratory observations on re-formation of ice jams.
3. Report on progress by March 82 and outline future work needed.

NATIONAL WATER RESEARCH INSTITUTE		Study Plan	NO: 82-316
STUDY TITLE	Frazil Formation and Properties.		DIV OR ORG HD
KEY WORDS	Frazil ice, saline water, turbulence		SEC'N OR GRP EHS
STUDY LEADER	Tsang, G.	TEL: 637-4735	PAE 1714
TEAM MEMBERS	Prof. Thoms O'D Hanley, University of Regina		DATE 82/01/25
ECS PROGRAM	Water Management Research		
ACTIV ELEM	Hydraulics		

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

- Phase I - Write a paper on formation of sea frazil by June '82. Obtain additional experimental data on sea frazil formation in summer '82.
- Phase II - Obtain data on formation and properties of frazil formed at different degrees of supercooling, by September '82. Write report by March '83.
- Phase III- Obtain data on formation and properties of frazil as the salinity of the water is gradually changed. (83/84).
- Phase IV Study the formation and properties of frazil formed under different turbulence conditions. (83/84).

Relevance:

Northern water control and hydroelectric developments require a knowledge of frazil ice properties formation and behaviour. In the Arctic salt water frazil may have different properties requiring different solutions to problems.

River flows, floods and the diversion of rivers, the design of water transfer channels will require a knowledge of frazil behaviour.

The behaviour of frazil and its properties remains unknown for estuarine environments.

Work Outline:

- Phase I 1. Analysis of experimental data obtained from last year's preliminary experiments and write a paper on the formation and properties of sea frazil for Workshop on Hydraulics of Ice-Covered Rivers, Edmonton, June, 1982. 2. Conduct supplementary experiments and further analysis of the data to guide Phase III study.
- Phase II 1. Laboratory experiment. 2. Analysis of data. 3. Preparation of scientific paper.
- Phase III 1. Laboratory experiment., 2. Analysis of data. 3. Writing of scientific paper.
- Phase IV 1. Overall planning. 2. Construction of experimental setup. 3. Experiment. 4. Analysis of experimental results. 5. Writing of report of scientific paper.

STUDY TITLE	Modelling of Underwater Gas Plumes	DIV OR ORG HD
KEY WORDS	Gas plumes, models, oil gas, blowouts	SEC'N OR GRP EHS
STUDY LEADER	Tsang, G. TEL: 637-4735	PAE 1714
TEAM MEMBERS		DATE 82/01/22
ECS PROGRAM	Water Management Research	
ACTIV ELEM	Hydraulics	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

1. From literature research, to find out how gas plumes were modelled in the past under laboratory conditions.
2. Complete preliminary report on theoretical study of the criteria governing the laboratory modelling of gas plumes. (Internal report or technical note to journal), by March 83.
3. Conduct laboratory experiments to verify theoretical predictions and to see what error range it will cause if the modelling criteria are not observed. (83/84)
4. Writing a paper incorporating the theoretical report mentioned in 2. (83/84)

Relevance:

Underwater gas and oil blowouts are significant events, especially in the Arctic. Oil recovery and contaminant procedures depend on being able to predict the oil gas plume behaviour. Action depends on acoustic information.

A preliminary analysis of the literature shows that tests and theories on which present action is based may be incorrect.

Work Outline:

1. Summarizing of theoretical work in orderly form.
2. Literature research on the past and current practice of gas plume modelling.
3. Writing of theoretical paper for internal report or journal technical note.
4. Design and setup of laboratory experiment if theoretical study shows that such work is necessary.
5. Laboratory experiments.
6. Analysis of experimental data.
7. Writing of paper for scientific publication.

STUDY TITLE	External Laboratory Service	DIV OR ORG HD
KEY WORDS		SEC'N OR GRP HDDIV
STUDY LEADER	Dick, T.M. TEL: 637-4738	PAE 1714
TEAM MEMBERS	Y.L. Lau, M.A. Skafel, N. DeZeeuw, J. Ford	82/4/16
ECS PROGRAM	Water Management Research	
ACTIV ELEM	Hydraulics	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

To make the best use of the national investment in specialized equipment for hydraulic and related studies.

Relevance:

Unique equipment and services are available to a limited extent in the Institute and are available to clients to improve technology, transfer and improve work undertaken in the private or public sector. The cost recovery policy is in effect.

Work Outline:

1. Prepare estimates of costs to client.
2. If necessary, undertake improvements, obtain services or materials using special allocation.
3. Cooperate with client.
4. Prepare report.
5. Bill client.

NATIONAL WATER RESEARCH INSTITUTE

Study Plan

NO: 82-319

STUDY TITLE	Evaluation, Calibration and Maintenance of Frazil Instrument	DIV OR ORG HD
KEY WORDS	Frazil ice, instrumentation, calibration,	SEC'N OR GRP EHS
STUDY LEADER	Tsang, G. TEL: 637-4735	PAE 1714
TEAM MEMBERS	M. Pedrosa, P. Carney	DATE 82/01/22
ECS PROGRAM	Water Management Research	
ACTIV ELEM	Hydraulics	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

1. To complete the report evaluating the Phase II development (The Fenco Instrument), by July 82.
2. To design and construct apparatus for calibration and evaluation of the frazil instrument that was developed in 1981-82.
3. To maintain and repair the above instrument to ensure that it is always in operational condition.
4. To calibrate and evaluate the above instrument and write report by March 83.

Relevance:

Measurement of frazil ice is essential to make advances in the technology of ice control and flood control. Measurement and prediction of frazil is highly significant for work in floods caused by ice and for the control design and impact of water control and hydroelectric structures in the arctic and sub-arctic areas.

Work Outline:

1. Complete the report on evaluation of the Phase II instrument.
2. Design and construction of calibration apparatus (components).
3. Maintenance and service of instrument.
4. Design and construction of evaluation setup.
5. Calibration and evaluation.
6. Report writing.

STUDY TITLE	Suspended Sediment Effects on Flow	DIV OR ORG HD
KEY WORDS	Suspended materials, sediments, rivers, flow, turbulence	SEC'N OR GRP EHS
STUDY LEADER	Lau, Y.L. TEL: 637-4329	PAE 1714
TEAM MEMBERS	B.G. Krishnappan	DATE 82/01/20
ECS PROGRAM	Water Management Research	
ACTIV ELEM	Hydraulics	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

To obtain the effect of suspended sediment on the friction factor and the turbulence characteristics of flow in open channels by March 1983.

Relevance:

Flow characteristics change when sediment is carried in suspension. However, reports of the effects of suspended sediments are often contradicting. This knowledge is required for the understanding of flow in natural streams and for assessing the effects of man-made changes in rivers.

Work Outline:

1. Flume set-up and preliminary experiments.
2. Experimental program.
3. Data analysis.
4. Report.

STUDY TITLE	Sediment Transport Under Ice Cover	DIV OR ORG HD
KEY WORDS	Sediments, turbulence, flow, ice	SEC'N OR GRP EHS
STUDY LEADER	Lau, Y.L. TEL: 637-4327	PAE 1714
TEAM MEMBERS	B.G. Krishnappan	DATE 82/01/20
ECS PROGRAM	Water Management Research	
ACTIV ELEM	Hydraulics	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

Obtain experimental data on bed form characteristics, sediment transport rate and turbulence characteristics in flows with top cover by January 1983. Comparison of sediment transport characteristics in ice-covered flow with those in free-surface flow by May 1983.

Relevance:

Sediment transport characteristics change when a river becomes ice covered. It is not known if the dimensionless relationships which have been established for free surface flows can be applied to ice-covered flows.

Work Outline:

1. Flume and Equipment Preparations.
2. Experiments.
3. Data Analysis.
4. Report

STUDY TITLE	Investigations of Mixing Using Turbulence Model	DIV OR ORG HD
KEY WORDS	Turbulence, models, secondary flow, mixing, transverse	SEC'N OR GRP EHS
STUDY LEADER	Krishnappan, B.G. TEL: 637-4327	PAE 1714
TEAM MEMBERS	Lau, Y.L.	DATE 82/01/20
ECS PROGRAM	Water Management Research	
ACTIV ELEM	Hydraulics	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

1. Develop a 3-D turbulence model capable of predicting turbulence-driven secondary circulations by December 1982.
2. Investigate the effects of width/depth ratio on velocity and concentration in channel flow by March 1983.
3. Investigate the variations of transverse mixing coefficient using model output by March 1984.

Relevance:

The effects of width/depth ratio on the secondary circulation and the mixing properties of open channel flows are not known. With a 3-d Model it would be possible to evaluate this effect quantitatively. The transverse mixing coefficient is a required input into the modelling of the spreading of effluents.

Work Outline:

1. Modify the present 3-D K-E model and incorporate algebraic stress relations into the model.
2. Develop a program to solve the resulting governing equations.
3. Debug program and check validity of the model by comparison with known solutions.
4. Investigate the effect of width to depth ratio on spreading of affluent.
5. Evaluate the variations of the transverse mixing coefficients.

STUDY TITLE	Formation of Meanders in Natural Streams	DIV OR ORG HD
KEY WORDS	Velocity field, meanders, circulation	SEC'N OR GRP EHS
STUDY LEADER	Krishnappan, B.G.	TEL: 637-4622 PAE 1714
TEAM MEMBERS		DATE 82/01/20
ECS PROGRAM	Water Management Research	
ACTIV ELEM	Hydraulics	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

1. Measure velocity field in sand bed channel to delineate secondary circulation by December 1982.
2. Test the influence of secondary circulation on meander formation using turbulence model by March 1982.

Relevance:

The basic mechanism responsible for the formation of meanders in sand bed channels still remains to be uncovered. The strong correlation between the width of the channel and meander wavelength seems to indicate the possibility for the secondary circulation to be the prime factor for initiation of meanders. This study is aimed at testing this hypothesis.

Work Outline:

1. Conduct velocity measurement using "Yaw" probe (3-hole pitot tube).
2. Analyse data to delineate secondary circulation.
3. Investigate the possibility of using turbulence models with sediment transport relations to predict the formation of meanders and meander characteristics.

STUDY TITLE	Prediction Scours at River Constrictions	DIV OR ORG HD
KEY WORDS	Islands, artificial, rivers, flow, models, structure	SEC'N OR GRP EHS
STUDY LEADER	Krishnappan, B.G.	TEL: 637-4622 PAE 1714
TEAM MEMBERS		DATE 82/01/20
ECS PROGRAM	Water Management Research	
ACTIV ELEM	Hydraulics	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

To apply MOBED for the prediction of general scour of the river bed in the vicinity of constrictions due to bridge-piers, artificial islands, etc., by March 1983.

Relevance:

The existing methods to compute the scouring of the river bed in the vicinity of a constriction are based on several simplifying assumptions including the consideration of steady and uniform flow. With the use of MOBED no such restrictions of river bed scours is possible. The model results can be used to evaluate the adequacy of the existing methods.

Work Outline:

1. Predict the bed scour depths for various constrictions and flow conditions using MOBED.
2. Compare results with those predicted using existing methods.
3. Report.

STUDY TITLE	Migration Speed of Dunes	DIV OR ORG HD
KEY WORDS	Dunes, migration speed, bedload, open channel flows	SEC'N OR GRP EHS
STUDY LEADER	Engel, P. TEL: 637-4737	PAE 1714
TEAM MEMBERS		DATE 82/01/20
ECS PROGRAM	Water Management Research	
ACTIV ELEM	Hydraulics	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

Obtain a comparison of different techniques which are used to determine the migration speed of dunes from bed profiles by March 31, 1983.

Relevance:

Knowledge of the speed of dunes is important for computation of bed load such as in the Hydrographic Method, maintenance of navigation channels and design of water intake works on alluvial streams.

Work Outline:

1. Design tests.
2. Develop computer program.
3. Conduct tests.
4. Analyse data.
5. Write reports.

STUDY TITLE	Critical Shear Stress-Effect of Size Distribution Cont'd	DIV OR ORG HD
KEY WORDS	Grain size, shear stress, flow, transitional	SEC'N OR GRP EHS
STUDY LEADER	Engel, P. TEL: 637-4737	PAE 1714
TEAM MEMBERS		DATE 82/01/20
ECS PROGRAM	Water Management Research	
ACTIV ELEM	Hydraulics	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

Determine the effects of grain size distribution of bed material on the critical shear stress and grain size roughness by October 1982.

Relevance:

The critical shear stress given as Shield's Diagrams is a basic design parameter for engineers. At present, the critical shear is still not clearly defined and its determination is still subject to considerable error. These tests will establish upper and lower limits on the shear stress obtained from Shield's Diagram.

Work Outline:

1. Design flume tests.
2. Conduct tests.
3. Analyse data.
4. Write report.

STUDY TITLE	Calibration of Bedload Samplers	DIV OR ORG HD
KEY WORDS	Calibration, bedload, sediments	SEC'N OR GRP EHS
STUDY LEADER	Engel, P. TEL: 637-4737	PAE 1714
TEAM MEMBERS		DATE 82/01/20
ECS PROGRAM	Water Management Research	
ACTIV ELEM	Hydraulics	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

Determine calibration equation for field application of V.U.V. type sampler by December 31, 1982.

Relevance:

This information is important to Water Survey of Canada in particular and river engineers in general. At present there is no such calibration equation and bed load samplers are very inaccurate. This study has been requested by W.S.C.

Work Outline:

1. Design flume experiments.
2. Conduct tests with 1/2 size sampler.
3. Analyse data.
4. Write report.

STUDY TITLE	Application of MOBED to Lesser Slave River	DIV OR ORG HD
KEY WORDS	Open channel flows, models, meanders	SEC'N OR GRP EHS
STUDY LEADER	Krishnappan, B.G. TEL: 637-4622	PAE 1714
TEAM MEMBERS		DATE 82/01/20
ECS PROGRAM	Water Management Research	
ACTIV ELEM	Hydraulics	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

Long Term: Continue the application of MOBED to Lesser Slave River in Alberta to predict long term impact of meander cut-offs and compare model predictions with the field data collected by the Alberta Environment. Completion date: not known.

Short Term: Simulate flows prior to meander cut-offs and compare model predictions with existing data - Progress report in March 1983.

Relevance:

The model MOBED is designed to predict short and long term impacts of changes imposed on a river as a result of river regulation and other works. The model has been already tested for both laboratory and field conditions. This study will provide another test to the model.

Work Outline:

1. Continue flow simulations for conditions prior to meander cut-offs.
2. Compared model predictions with existing field data collected by Alberta Environment.
3. Interim progress report.
4. Run model with meander cut-off conditions and predict long term response of the river.

STUDY TITLE	User's Manual for Stream Tube Model	DIV OR ORG HD
KEY WORDS	Models, mixing, transverse, open channel flows	SEC'N OR GRP EHS
STUDY LEADER	Krishnappan, B.G. TEL: 637-4622	PAE 1714
TEAM MEMBERS	Y.L. Lau	DATE 82/01/20
ECS PROGRAM	Water Management Research	
ACTIV ELEM	Hydraulics	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

To prepare a user's manual and program documentation for the model that predicts transverse mixing in natural streams using "Stream Tube" concept.

Relevance:

A computer program has been developed at the Hydraulics Division to predict the transverse spreading of a pollutant in a natural river. Program documentation and a user manual will be useful for practicing engineers to apply this model for practical calculation. Would form a valuable technology transfer document.

Work Outline:

1. Documentation of program.
2. Preparation of User's Manual.
3. Possible organization of a seminar to acquaint the model to potential users.

STUDY TITLE	Task Force on River Mixing	DIV OR ORG HD
KEY WORDS	Rivers, mixing, dispersion	SEC'N OR GRP EHS
STUDY LEADER	Lau, Y. L. TEL: 637-4327	PAE 1714
TEAM MEMBERS	B.G. Krishnappan	DATE 82/01/20
ECS PROGRAM	Water Management Research	
ACTIV ELEM	Hydraulics	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

To produce a state-of-the-art report on mixing processes in rivers as an output of the CSCE Task Force, by December 1982.

Relevance:

A state-of-the-art report on this subject is a very useful means of transferring technology to the engineering community. The Canadian Society for Civil Engineering's Research Committee invited Y.L. Lau to be chairman of this task force and B.G. Krishanppan to be a member.

Work Outline:

1. Write contribution to report.
2. Coordinate meetings.
3. Compile and edit report.

NATIONAL WATER RESEARCH INSTITUTE

Study Plan

NO: 82-331

STUDY TITLE	Ice Problems in Millbrook at Kentville, N.S.	DIV OR ORG HD
KEY WORDS	Flooding, ice jams	SEC'N OR GRP EHS
STUDY LEADER	Beltaos, S.	TEL: 637-4329 PAE 1714
TEAM MEMBERS		DATE 82/01/20
ECS PROGRAM	Water Management Research	
ACTIV ELEM	Hydraulics	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

Provide advice as requested in 1982/83 to IWD regarding:
Consultant's study of ice problems and possible alleviations methods in
Millbrook at Kentville, N.S.

Relevance:

This study responds to a request by IWD - Atlantic Region, it is relevant to our
study HD 813332.

Work Outline:

1. Provide advice from time to time as requested.

STUDY TITLE	Rideau River Stormwater Management Study	DIV OR ORG HD
KEY WORDS	Runoff	SEC'N OR GRP EHS
STUDY LEADER	Marsalek, J. TEL: 637-4328	PAE 1714
TEAM MEMBERS	EPS, MOE, Regional Municipality of Ottawa-Carleton (RMOC)	DATE 82/01/20
ECS PROGRAM	Water Management Research	
ACTIV ELEM	Hydraulics	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

1. Provide technical and scientific advice to the Technical Committee for the study during the fiscal year.
2. Service a scientific authority for one of the study contracts - Investigations of the Kennedy-Burnett Pond.

Relevance:

NWRI involvement has been requested by the Technical Committee in charge of the Rideau River Study. The study objectives are relevant to IWD research priorities concerning the impact of man's activities on the hydrological regime and on water quality.

The study is jointly sponsored by MOE, DOE, and RMOC.

Work Outline:

1. Attend meetings, review reports, proposals, etc. - are required.
2. Supervise the contract re the Kennedy-Burnett Pond (in cooperation with others).

STUDY TITLE	Waterford River Basin - Newfoundland	DIV OR ORG HD
KEY WORDS	Urban, rivers, runoff, water quality, systems modelling, trends, management	SEC'N OR GRP EHS
STUDY LEADER	Marsalek, J. TEL: 637-4328	PAE 1714
TEAM MEMBERS	Technical Committee for the Waterford River Study	DATE 82/01/20
ECS PROGRAM	Water Management Research	
ACTIV ELEM	Hydraulics	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

1. To evaluate the impacts of urbanization on water quality and quantity in the Waterford River Basin by 1986.
2. Analyse field data collected in the urban test catchment during 1981-82 by March 1982.
3. Simulate selected rainfall/runoff events observed in the test catchment by March 1983.
4. Participate in study management.

Relevance:

Urbanization of the Waterford Basin is causing serious water quality and quantity problems for residents of the Basin. The effects of urbanization on water resources need to be investigated, in order to develop guidelines for effective control and management of the urban development.

The study is jointly sponsored by DOE and the Province of Newfoundland, HD's involvement has been requested by SDG, IWD.

Work Outline:

1. Obtain field data from the urban test catchment and reduce them to a computer compatible form.
2. Collect catchment characteristics data needed for hydrological simulations.
3. Screen observed rainfall/runoff events and reproduce the selected ones by computer simulation.
4. Calibrate a weir installation.
5. Serve on the Technical Committee in charge of the study.

STUDY TITLE	UNESCO Manuals on Urban Drainage (International Hydrological Progress Project A.2.9)	DIV OR ORG HD
KEY WORDS	International relations, technology transfer, urban, runoff, analysis, instrumentation	SEC'N OR GRP EHS
STUDY LEADER	Marsalek, J. TEL: 637-4328	PAE 1714
TEAM MEMBERS	UNESCO Working Group	DATE 82/01/20
ECS PROGRAM	Water Management Research	
ACTIV ELEM	Hydraulics	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

Finalize assigned chapters of two UNESCO Manuals by the end of the fiscal year.

Relevance:

This study has been initiated by UNESCO under the International Hydrological Program. HD's involvement has been requested by UNESCO.

Work Outline:

1. Compile comments from members of the working group.
2. Revise the manuscript.
3. Finalize the manuscript.

STUDY TITLE	Flow and Bedform Interactions	DIV OR ORG HD
KEY WORDS	Flow resistance, bedforms, river modelling	SEC'N OR GRP EHS
STUDY LEADER	Y. L. Lau TEL: 637-4327	PAE 1714
TEAM MEMBERS	Post-Doctoral Fellow	DATE 82/02/05
ECS PROGRAM	Water Management Research	
ACTIV ELEM	Hydraulics	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

1. To verify existing equations of flow resistance under different bedform regimes.
2. To obtain the transient response of bedforms and flow resistance to changes in flow rates.

Relevance:

The response of bedforms as flow rate changes is not well-known. As flow resistance is very dependent on bedform configurations, it is necessary to obtain this knowledge in order to accurately predict river response. Models such as MOBED can give better results if improved knowledge of river resistance is available.

Work Outline:

1. Literature review.
2. Experimental program.
3. Report.

STUDY TITLE	Wave Amplification and Decay and Turbulent Mixing	DIV OR ORG HD
KEY WORDS	Waves, wind, turbulence	SEC'N OR GRP SHORES
STUDY LEADER	Donelan, M. TEL: 637-4231	PAE 1714
TEAM MEMBERS	M. Skafel, D. Beesley, T. Nudds	DATE 82/01/25
ECS PROGRAM	Water Management Research	
ACTIV ELEM	Hydraulics	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

1. To measure the turbulent parameters close to a wavy water surface under conditions of both amplification and decay of the waves. The results are to be reported by March 1983.
2. To examine turbulent mixing beneath a wind-stressed water surface with and without waves by March 1983.

Relevance:

The process of wave amplification and attenuation by wind is still largely unsolved, but, various clues are beginning to fit together. Further understanding of the process will depend on knowing the structure of turbulence very near the surface. We are particularly well equipped to study this in our large wind-wave flume.

Turbulent mixing due to wind stress and waves is the most significant physical process in epilimnionic development. Detailed measurement of turbulence beneath waves are required to throw some light on the problem.

Work Outline:

1. Purchase equipment.
2. Wind-wave flume experiments (8 weeks).
3. Experiments in wind-water tunnel in cold room (8 weeks).
4. Preliminary computer analysis.

STUDY TITLE	Air/Water Interaction	DIV OR ORG HD
KEY WORDS	Waves, wind, turbulence	SEC'N OR GRP SHORES
STUDY LEADER	Donelan, M.	TEL: 637-4231 PAE 1714
TEAM MEMBERS	D. Beesley	DATE 82/01/25
ECS PROGRAM	Water Management Research	
ACTIV ELEM	Hydraulics	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

To develop theories or methods which give reliable estimates of water roughness, surface flumes and wave characteristics by 1985, by:

1. Determining the coefficients of heat and mass transfer from a water surface disturbed by waves.
2. Determining the effect on the air sea fluxes of over-developed waves or waves propagating against the wind direction.

Relevance:

The turbulent transfers of heat and moisture are significant components of the heat and water budgets of lakes. From observations made at the WAVES tower under a wide range of conditions, the characteristics of the coefficients of heat and moisture can be clarified for improved modelling. We now know a great deal about momentum transfer to the surface during wave growth, but almost nothing about the transfers teaching to wave decay. Using field and laboratory data (the former already in hand) we expect to fill these gaps in our knowledge.

Work Outline:

1. Computer analysis of air/water interaction data.
2. Report writing.
3. Drafting of figures.
4. Continuing existing contract to study theoretical aspects of the mechanics of waves #OISE.KL347-1-0727 (Ends 6/83).

STUDY TITLE	Atlantic Remote Sensing Land-Ocean Experiment (ARSLOE)	DIV OR ORG HD
KEY WORDS	Waves, buoys, wind	SEC'N OR GRP SHORES
STUDY LEADER	Skafel, M.G. TEL: 637-4738	PAE 1714
TEAM MEMBERS	M. Donelan Long (NOAA)	DATE 82/01/25
ECS PROGRAM	Water Management Research	
ACTIV ELEM	Hydraulics	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

1. To complete the comparison of the Motion Package Buoy performance with the buoys participating in the ARSLOE, by October 1982.
2. To investigate the response of directional characteristics of the wave field to changing wind by March 1983.

Relevance:

The ARSLOE provides a unique opportunity to test the Motion Package Buoy against other wave direction buoys and to examine the response of the wave field to touring winds. The Motion Package Buoy could be promoted as a directional wave-measuring system by Canadian industry.

Work Outline:

1. Compare MPB performance with other buoys and prepare report.
2. Select suitable storms from data set and examine wave response. to changing wind conditions.
3. Prepare report on findings of 2.

STUDY TITLE	50 Point Marina	DIV OR ORG HD
KEY WORDS	Waves, harbours	SEC'N OR GRP SHORES
STUDY LEADER	Skafel, M.G.	TEL: 637-4736 PAE 1714
TEAM MEMBERS	C. Bishop, Tech Ops, ESS	DATE 82/01/25
ECS PROGRAM	Water Management Research	
ACTIV ELEM	Hydraulics	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

To evaluate the performance of the "as constructed" wave protection at 50 Point Marina, based on one season's field data, by March 1982.

Relevance:

Request from Small Craft Harbours. Partial cost recovery from SCH. The wave protection schemes for this marina were designed based on a physical model study. Evaluation of its performance will help in interpretation of results of future model studies.

Work Outline:

1. Assemble measuring system.
2. Install system and maintain.
3. Collect data.
4. Retrieve system.
5. Analyse data.
6. Prepare report.

STUDY TITLE	Wind-wave Flume Operation	DIV OR ORG HD
KEY WORDS	Waves, wind	SEC'N OR GRP SHORES
STUDY LEADER	Skafel, M.G. TEL: 637-4736	PAE 1714
TEAM MEMBERS	T. Nudds	DATE 82/01/25
ECS PROGRAM	Water Management Research	
ACTIV ELEM	Hydraulics	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

To maintain and upgrade the component systems of the wind-wave flume.

Relevance:

Components of the wind-wave flume need periodic upgrading and maintenance which cannot be realistically charged to individual studies. Efficiency depends on maintaining and developing equipment and instruments.

Work Outline:

1. Implement software upgrades and write handler for D/A converter.
(Purchased in 1981-82.)
2. Order long lead time spare parts for MTS wave machine.
3. Write several data analysis programs to augment existing package.
(Summary statistics, more convenient graphics.)
4. Build new wave probe holders; moveable anemometer mounts; new wave machine for "blue" flume.
5. Construct ground access gates to flume.

NATIONAL WATER RESEARCH INSTITUTE

Study Plan

NO: 82-342

STUDY TITLE	Nearshore Sediment Transport	DIV OR ORG HD
KEY WORDS	Waves, sediments, littoral zone, nearshore	SEC'N OR GRP SHORES
STUDY LEADER	Skafel, M.G. TEL: 637-4736	PAE 1714
TEAM MEMBERS	J.P. Coakley	DATE 82/01/25
ECS PROGRAM	Water Management Research	
ACTIV ELEM	Hydraulics	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

To document findings of experiments at Van Wagner's Beach in two papers to be presented in November 1982.

Relevance:

Documentation of case studies of longshore sediment transport is an important step in development of models. Such models will permit computation of local and general shore evolution trends, which are essential for the planning and management of federal lands as well as for general management of the nearshore environment and the assessment of proposed shoreline structures.

Work Outline:

1. Prepare and present a paper on uncertainties in the application of wave direction to nearshore transport models (Internat'l Conf. on Coastal Eng'g.).
2. Prepare and present a paper on longshore suspended sediment discharge resulting from wave action (Internat'l Conf. on Coastal Eng'g.).

STUDY TITLE	Long Point Evolution	DIV OR ORG HD
KEY WORDS	Lake Erie, coastal zone	SEC'N OR GRP SHORES
STUDY LEADER	Coakley, J.P.	TEL: 637-4248 PAE 1714
TEAM MEMBERS		DATE 82/01/25
ECS PROGRAM	Water Management Research	
ACTIV ELEM	Hydraulics	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

1981/72 analysis of field-collected data regarding Long Point will be completed and data from other sources will be compiled and assessed.

1982/83 the evolution of the Long Point foreland (within the framework of postglacial processes in the Lake Erie basin) will be documented and publicized.

Relevance:

1. The planning of shore-zone areas has been identified as an important part of the Canada Water Act requirements. The study would contribute to this requirement.
2. The study would aid in the proper management of Federal Government lands (CWS and DOT) on Long Point.
3. Long Point is an important stop-over point on the migration route for many bird species. Knowledge of present evolutionary trends would aid in minimizing the impact of such trends in this regard.

Work Outline:

1. Data Analysis: - grain-size of samples from the 1981 borehole
- fossil pollen collected from the 1980 and 1981 boreholes, for stratigraphic control.
2. Assemble shore-zone subsurface and other information from sources outside NWRI (e.g., Ontario Government agencies, published reports, U.S. Army Corps of Engineers).
3. Lead a field trip to the area (Int. Assoc. of Sedimentologists 1982 Congress).
4. Draft a comprehensive report.

NATIONAL WATER RESEARCH INSTITUTE

Study Plan

NO: 82-344

STUDY TITLE	Long-term Shore Processes at Pointe-aux-Pins	DIV OR ORG HD
KEY WORDS	Lake Erie, coastal zone	SEC'N OR GRP SHORES
STUDY LEADER	Coakley, J.P.	TEL: 637-4248 PAE 1714
TEAM MEMBERS		DATE 82/01/25
ECS PROGRAM	Water Management Research	
ACTIV ELEM	Hydraulics	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

1982/83: Field investigation into the bottom sediments in the lake SW of the existing spit will be investigated to define the lakeward extent of the ancestral Pointe-aux-Pins postglacial landform.

1982/83: A reconstruction of the landform's evolution will be formulated in the context of the postglacial process regime in Lake Erie.

Relevance:

1. The accretionary landforms located at intervals along the Lake Erie north shore contain, in their sedimentary record, clues as to how fast and why the central Lake Erie shoreline has developed as it has.
2. Management of developments along this shoreline requires more knowledge of these long-term trends.

Work Outline:

1. Using the bibliography compiled in 1978, assemble copies of subsurface information, especially related to the contact between glacial and postglacial (spit) deposits.
2. Conduct a brief coring program in central Lake Erie (SW of Pointe-aux-Pins) in June 1982 to supplement (2) and obtain sufficient shells for C14 dating.
3. Incorporate into the Long Point comprehensive report.

NATIONAL WATER RESEARCH INSTITUTE		Study Plan	NO: 82-345
STUDY TITLE	Laboratory Test of Soil Erodibility		DIV OR ORG HD
KEY WORDS	Erosion, littoral zone, nearshore		SEC'N OR GRP SHORES
STUDY LEADER	Zeman, A.J.	TEL: 637-4248	PAE 1714
TEAM MEMBERS	B.G. Krishnappan, (Consultant) Technician (SPS, HD)		DATE 82/01/25
ECS PROGRAM	Water Management Research		
ACTIV ELEM	Hydraulics		

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

To relate sub-aqueous erodibility for geotechnical properties of cohesive soils.
(a) using undisturbed samples by March 1983;
(b) using compacted samples to simulate a wider range of natural conditions by March 1984.

Relevance:

Knowledge of soil erodibility under controlled hydraulic conditions is important for a better understanding of erosion process and for effective conservation and planning measures. The results of laboratory tests will be compared with available field measurements and observations.

Work Outline:

1. A review of literature relating sub-aqueous erodibility to geotechnical properties of cohesive soils.
2. Field sampling (possibly using a light-colight rotary drill).
3. Measurements of erosion rates and critical shear stresses in the rotating-cylinder apparatus.
4. Measurements of Atterberg limits, void ratio, vane shear strength and clay content of samples obtained under step 2.
5. Evaluation of experiments in a report.

STUDY TITLE	Geotechnical Study of Port Burwell	DIV OR ORG HD
KEY WORDS	Port Burwell, pore pressure monitoring, slope indicator monitoring	SEC'N OR GRP SHORES
STUDY LEADER	Zeman, A.J. TEL: 637-4248	PAE 1714
TEAM MEMBERS	Technician (HD, SPS), Technical Operation	DATE 82/01/25
ECS PROGRAM	Water Management Research	
ACTIV ELEM	Hydraulics	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

To analyze the role of ground water, pore pressures and changing slope geometry on bluff stability and report by December 1982. This is the final phase of the study.

Relevance:

The study is a continuation of long-term investigation of a stretch of shore undergoing rapid bluff recession. The analysis of field and laboratory data obtained will provide an important case history for shore erosion research. Effective and ecologically sound methods to conserve land and control erosion are required for the future.

Work Outline:

1. Monitoring of the slope indicator casing and the vibrating-wire picxometers till bluff failure.
2. Final topographic survey of the site after bluff failure and removal of the trailer from the site.
3. Presentation of Research Summary at the NWRI coastal Workshop (Nov. 1982).
4. Final report.

STUDY TITLE	Nearshore Profile Changes in the Great Lakes	DIV OR ORG HD
KEY WORDS	Nearshore, Great Lakes, sediments	SEC'N OR GRP SHORES
STUDY LEADER	Rukavina, N.A. TEL: 637-4247	PAE 1714
TEAM MEMBERS	K. Hill, B. Montgomery/B. Waldock (OSS)	DATE 82/01/25
ECS PROGRAM	Water Management Research	
ACTIV ELEM	Hydraulics	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

To measure nearshore profile changes of depositional and erosional slopes in order to establish their scale and to relate changes to storm activity and seasonal water level variations.

1982 Goals:

1. To complete field work analysis and to report on results of 1981 survey.
2. To continue with the development of an automatic datalogger for profile data.

Relevance:

Contribution to:

1. Littoral transport model, specifically the scale of subaqueous erosion and sediment supply.
2. Coastal evolution research.
4. OSS interest in erosion/accretion monitoring in the Arctic.

Work Outline:

1. Complete field work at Van Wagner's Beach site.
2. Analysis/report on 1981 data.
3. Design/develop/test underwater rotary tool for frame installation, collection of till cores.

STUDY TITLE	Nearshore Sediment Data Service	DIV OR ORG HD
KEY WORDS	Nearshore, sediments, technology transfer	SEC'N OR GRP SHORES
STUDY LEADER	Rukavina, N. TEL: 637-4247	PAE 1714
TEAM MEMBERS	K. Hill, Contractor (OGS Support)	DATE 82/01/25
ECS PROGRAM	Water Management Research	
ACTIV ELEM	Hydraulics	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

1. To prepare reports on nearshore sediment data as required, in response to internal and external requests for information required for research, engineering, and planning purposes.
2. To arrange, with the cooperation of the Ontario Geological Survey, for a report on the composition of Lake Ontario nearshore sands and gravels with an assessment of their economic potential.

Relevance:

There is a need (demonstrated by an increasing number of requests during the past few years) for nearshore data reports to answer specific requirements not served by the standard report series or computer file listings.

Work Outline:

1. Review request with Management.
2. Compile data.
3. Prepare report.
4. Arrange for contract study.
5. Review preliminary report.

NATIONAL WATER RESEARCH INSTITUTE		Study Plan	NO: 82-349
STUDY TITLE	Shoreline Dredge Disposal Sites		DIV OR ORG HD
KEY WORDS	Dredging		SEC'N OR GRP SHORES
STUDY LEADER	Skafel, M.G.	TEL: 637-4736	PAE 1714
TEAM MEMBERS			DATE 82/01/25
ECS PROGRAM	Water Management Research		
ACTIV ELEM	Hydraulics		

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

To examine the rational and procedures used to design dredge spoil disposal sites at or near the shore, and to comment of their practicality and effectiveness, by March 1983.

Relevance:

Contaminated dredge spoil, for example from harbours, is sometimes placed in contaminated facilities at or near the shoreline. Facilities placed on the shoreline can be subjected to severe loading caused by waves, and to damage; furthermore, many reaches of shoreline are actively eroding. Interpretation of existing shore protection structural design criteria is particularly difficult in light of the requirement that there be no release of contaminants.

Work Outline:

- 1. Literature review of current practice, and discussion with EPC.
- 2. Prepare a short report on the implication of current practices.

NATIONAL WATER RESEARCH INSTITUTE

Study Plan

NO: 82-350

STUDY TITLE	Cooperative study with the Department of Public Works	DIV OR ORG HD
KEY WORDS	Harbours, waves, models, public works	SEC'N OR GRP SHORES
STUDY LEADER	Skafel, M.G. TEL: 637-4736	PAE 1714
TEAM MEMBERS	C. Bishop	DATE 82/01/25
ECS PROGRAM	Water Management Research	
ACTIV ELEM	Hydraulics	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

To assist in the planning of major coastal structures so that they meet performance and environmental criteria. Each case will have specific goals.

Relevance:

Investment in coastal structures such as harbours and breakwaters are costly. Selection of the optimum plan to meeting fiscal, environmental, and engineering criteria requires the use of sophisticated model technology and the analysis of available field data.

(Agreement with DPW by Director's letter of January 24, 1970: 1371-6)

Work Outline:

1. This cooperative study will be composed of a series of projects. Each problem will be studied on its own merits.
(Incremental costs will be recovered from DPW or Small Craft Harbours if they are the "client" of DPW.)

STUDY TITLE	Oil Industry Coastal Engineering Research	DIV OR ORG HD
KEY WORDS	Technology transfer, Environmental Impact Statements (EIS)	SEC'N OR GRP SHORES
STUDY LEADER	Bishop, C. TEL: 637-4535	PAE 1714
TEAM MEMBERS	M. Skafel	DATE 82/01/25
ECS PROGRAM	Water Management Research	
ACTIV ELEM	Hydraulics	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

To conduct basic research in areas of coastal engineering applicable to the oil industry's offshore drilling programs.

Relevance

As part of the Environmental Assessment Review Process (EARP), NWRI staff are asked to comment on the adequacy of design for some offshore drilling facilities. These designs are often at the frontier of existing coastal engineering knowledge and there is an urgent need for some related research.

Work Outline:

1. Meet with representatives of the oil companies involved in frontier exploration and production to establish their perceived needs for coastal engineering research.
2. Conduct model studies at NWRI as required.

STUDY TITLE	Shore Protection Methods	DIV OR ORG HD
KEY WORDS	Harbours, littoral zone, technology transfer	SEC'N OR GRP SHORES
STUDY LEADER	Bishop, C. TEL: 637-4535	PAE 1714
TEAM MEMBERS		DATE 82/01/25
ECS PROGRAM	Water Management Research	
ACTIV ELEM	Hydraulics	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

Conduct a literature survey of shore protection methods and prepare a state-of-the-art report by March, 1983.

Relevance:

This will be a useful technology transfer report when discussing shore protection alternatives with anyone contemplating shoreline engineering. Continuation of Study HD 81 4327.

Work Outline:

1. Literature survey.
2. Site visits.
3. Write report.

STUDY TITLE	Floating Tire Breakwater Research	DIV OR ORG HD
KEY WORDS	Technology transfer, harbours, waves	SEC'N OR GRP SHORES
STUDY LEADER	Bishop, C. TEL: 637-4535	PAE 1714
TEAM MEMBERS		DATE 82/01/25
ECS PROGRAM	Water Management Research	
ACTIV ELEM	Hydraulics	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

Conduct field monitoring program during 1982 at LaSalle Park Marina in Burlington, to measure wave transmission and mooring force characteristics of the installed floating tire breakwater. Incorporate results in revised edition of NWRI's manual on the design and construction of FTB's by November 1983.

Relevance:

The proximity of the LaSalle Park Marina provides an excellent opportunity to collect field data in order to verify existing data from model tests. The manual is designed to answer requests from clients and to upgrade FTB usage. Continuation of study HD 83 4329.

Work Outline:

1. Prepare electronic wave and force measuring equipment (see attached note).
2. Field Monitoring Program.
3. Prepare data analysis package.
4. Analyze data.
5. Write report.
6. Revise and update PTB manual.
7. Incorporate results of FTB monitoring program in revised FTB manual.
8. Publish manual.

STUDY TITLE	Third Workshop on Great Lakes Coastal Erosion and Sedimentation	DIV OR ORG HD
KEY WORDS	Technology transfer, coastal zone, erosion sediments	SHORES
STUDY LEADER	Rukavina, N.A. TEL: 637-4247	PAE 1714
TEAM MEMBERS	Shore Processes Section and Technical Support Unit	DATE 82/01/25
ECS PROGRAM	Water Management Research	
ACTIV ELEM	Hydraulics	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

To organize a meeting on Great Lakes Coastal Research and to publish its proceedings. Proposed date is November 2, 1982. Publication by February 1983.

Relevance:

To continue NWRI's initiative in arranging for interchange of information and technology transfer by Great Lakes scientists.

Work Outline:

1. Planning.
2. Meeting.
3. Editing, publication, distribution of proceedings.

NATIONAL WATER RESEARCH INSTITUTE		Study Plan	NO: 82-355
STUDY TITLE	Nearshore Sediment Data Reports/Atlas		DIV OR ORG HD
KEY WORDS	Nearshore, Great Lakes, sediments, atlas		SEC'N OR GRP SHORES
STUDY LEADER	Rukavina, N.A.	TEL: 637-4247	PAE 1714
TEAM MEMBERS	K. Hill		DATE 82/01/25
ECS PROGRAM	Water Management Research		
ACTIV ELEM	Hydraulics		

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

To organize and publish field and laboratory data for Great Lakes nearshore sediments as a Data Report Series and Coastal Sediment Atlas.

1982 Goal:

To complete editing of computer files and maps of nearshore data and to document survey techniques and data reduction procedures.

Relevance:

To improve accessibility of data from nearshore surveys to consulting engineers, planners, and coastal researchers. To contribute to the geologic mapping of Great Lakes sediments.

Work Outline:

1. Edit nearshore data files/maps.
2. Document procedures.

STUDY TITLE	Division Management - HD	DIV OR ORG HD
KEY WORDS	Management, administration	SEC'N OR GRP HDDIV
STUDY LEADER	Dick, T.M. TEL: 637-4738	PAE 1714
TEAM MEMBERS	A. Mueller, C. Leacock	DATE 82/02/19
ECS PROGRAM	Water Management Research	
ACTIV ELEM	Hydraulics	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

To provide planning, direction, coordination and control of scientific and service projects.

Relevance:

To ensure that the scientific quality is maintained and that funds are expended efficiently and in conformity with Departmental regulations.

Work Outline:

1. Division Chief: Provides direction for the scientific program, decides priorities, establishes objectives and goals, allocates funds and approves expenditures within authority.
2. Secretary: Provides office management of records, correspondence and studies. Arranges for meetings, takes minutes and greets visitors. Types and dispatches all Divisonal correspondence.
3. Administrative Officer:
Provides administrative services for division to ensure orderly flow of information, advice controls and methods. Recommends action to ensure safe working conditions.

NATIONAL WATER RESEARCH INSTITUTE		Study Plan	NO: 82-359
STUDY TITLE	Division Management - ENSRVS		DIV OR ORG HD
KEY WORDS	Management, administration		SEC'N OR GRP HDDIV
STUDY LEADER	Dick, T.M.	TEL: 637-4738	PAE 1714
TEAM MEMBERS	A. Mueller, C. Leacock		DATE 82/02/19
ECS PROGRAM	Water Management Research		
ACTIV ELEM	Hydraulics		

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

To provide planning, direction, coordination and control of scientific and service projects.

Relevance:

To ensure that the scientific quality is maintained and that funds are expended efficiently and in conformity with Departmental regulations.

Work Outline:

1. Division Chief: Provides direction for the scientific program, decides priorities, establishes objectives and goals, allocates funds and approves expenditures within authority.
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3. Administrative Officer: Provides administrative services for division to ensure orderly flow of information, advice controls and methods.

STUDY TITLE	Open House	DIV OR ORG HD
KEY WORDS	Information, public	SEC'N OR GRP HDDIV
STUDY LEADER	Dick, T.M. TEL: 637-4738	PAE 1700
TEAM MEMBERS		DATE 82/01/27
ECS PROGRAM	Water Management Research	
ACTIV ELEM	General	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

STUDY TITLE	Division Capital Plan - Engineering	DIV OR ORG HD
KEY WORDS	Equipment, finance, instrumentation, plan, procurement	SEC'N OR GRP ENSRVS
STUDY LEADER	Dick, T.M. TEL: 637-4738	PAE 1700
TEAM MEMBERS	J.S. Ford, A. Pashley	DATE 82/01/29
ECS PROGRAM	Water Management Research	
ACTIV ELEM	General	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

1. To systematically replace obsolete equipment in order to maintain efficiency and effectiveness of the research and service programs.
2. To acquire new equipment for efficient and effective measurements and data acquisition for research studies.

Relevance:

To meet requirements of fiscal responsibility and planning in management.

Work Outline:

As shown in attached schedules:

- a) Obsolescence replacements
 1. Hydraulics
 2. Engineering
- b) New
 1. Hydraulics
 2. Engineering
- c) Five year plan for obsolescence replacements
 1. Hydraulics
 2. Engineering

STUDY TITLE	Division Capital Plan - Hydraulics	DIV OR ORG HD
KEY WORDS	Equipment, finance, instrumentation, plan, procurement	SEC'N OR GRP HDDIV
STUDY LEADER	T.M. Dick TEL: 637-4738	PAE 1714
TEAM MEMBERS	Y.L. Lau, M.G. Skafel, C. DeZeeuw	DATE 82/01/29
ECS PROGRAM	Water Management Research	
ACTIV ELEM	Hydraulics	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

1. To systematically replace obsolete equipment in order to maintain efficiency and effectiveness of the research and service programs.
2. To acquire new equipment for efficient and effective measurements and data acquisition for research studies.

Relevance:

To meet requirements of fiscal responsibility and planning in management.

Work Outline:

As shown in attached schedules:

- a) Osbolescence replacements
 1. Hydraulics
 2. Engineering
- b) New
 1. Hydraulics
 2. Engineering
- c) Five year plan for obsolescence replacements
 1. Hydraulics
 2. Engineering

STUDY TITLE	Office Support Services - Hydraulics	DIV OR ORG HD
KEY WORDS	Administration, data collection	SEC'N OR GRP OFSRVS
STUDY LEADER	Head, Office Services TEL: 637-4236	PAE 1714
TEAM MEMBERS	D. Jacobs, E. Jones	DATE 82/01/19
ECS PROGRAM	Water Management Research	
ACTIV ELEM	Hydraulics	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

To provide efficient and orderly production and distribution of reports and publications, complete and accurate records and to collect relevant statistics.

Relevance:

The end product of scientific research is reports and publications.

Work Outline:

1. Head Office Services: Manages the efficient and orderly production and distribution of reports and publications. Keeps record of requests for reports. Provides for efficient and smooth operation of Divisional office.
2. Divisional Clerk: Keeps records, files requisitions, records requisitions and leases with DSS, maintains inventory files and types calibration certificates, prepares invoices for billing.
3. Machine Operator: Types all reports, maintains library of completed manuscripts.

STUDY TITLE	Office Support Services - ESS	DIV OR ORG HD
KEY WORDS	Administration, data collection	SEC'N OR GRP OFSRVS
STUDY LEADER	Head, Office Services	TEL: PAE 1700
TEAM MEMBERS	D. Jacobs, N. Snelling	DATE 82/01/19
ECS PROGRAM	Water Management Research	
ACTIV ELEM	General	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

To provide efficient and orderly production and distribution of reports and publications, complete and accurate records and to collect relevant statistics.

Relevance:

The end product of scientific research is reports and publications.

Work Outline:

1. Head Office Services: Manages the efficient and orderly production and distribution of reports and publications. Keeps record of requests for reports. Provides for efficient and smooth operation of divisional office.
2. Divisional Clerk: Keeps records, files requisitions, records requisitions and leases with DSS, maintains inventory files and types calibration certificates, prepares invoices for billing
3. Machine Operator: Types all reports, maintains library of completed manuscripts.

STUDY TITLE	Drafting Services to CCIW	DIV OR ORG HD
KEY WORDS	Drafting, illustrating, photography, visual aids,	SEC'N OR GRP ENSRVS
STUDY LEADER	Finn, W. TEL: 637-4278	PAE 1700
TEAM MEMBERS	M. Donnelly, P. McColl, J. Van Nynatten, J. Field (term), & Contract	DATE 82/01/22
ECS PROGRAM	Water Management Research	
ACTIV ELEM	General	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

1. To provide drafting and illustrating services for CCIW's Publication and Media activities. To provide photography services as above.
2. To provide occasional mechanical drafting service.
3. To provide occasional electronic drafting service.

Relevance:

The Scientific & Engineering Staff at the Canada Centre for Inland Waters produce many formal papers, reports and presentations. All these require drafting, illustration, visual aids, and photography support which is provided by the drafting office.

Work Outline:

Complete drawings and illustrations, provide photography, visual aids and reprographic service for CCIW staff.

STUDY TITLE	Common User Equipment Maintenance	DIV OR ORG HD
KEY WORDS	Maintenance, equipment	SEC'N OR GRP ENSERVS
STUDY LEADER	Pashley, A. TEL: 637-4263	PAE 1700
TEAM MEMBERS	R. Boucher, P. Carney, H. Savile, D. Whyte, F. Chumley, K. Kalter, G. Olsen	DATE 82/01/22
ECS PROGRAM	Water Management Research	
ACTIV ELEM	General	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

1. To provide structural, electrical pneumatic, hydraulic, and mechanical maintenance to equipment in common use at NWRI. To maintain a specialized components store. To improve equipment and methods to benefit maintenance and testing and specifically to acquire a tension/compression test system for cables, terminations, and miscellaneous structures.
2. To provide some simple maintenance to building services.

Relevance:

Equipment must be reliable and left in good order to ensure efficient and effective measurements and data gathering.

Work Outline:

1. Maintain commonly used equipment such as coring devices, sampling devices, field centrifuges, CCIW lake platform.
2. Provide limited maintenance assistance to building service.
3. Maintain specialized parts stores.
4. Acquire by purchase and in-house manufacture, attension/compression test system for cables terminations and misc. structures.
5. Contract out electrical maintenance.

STUDY TITLE	Metrication of Equipment R & D and ICML Units	DIV OR ORG HD
KEY WORDS	Metrication	SEC'N OR GRP ENSRVS
STUDY LEADER	Pashley, A. TEL: 637-4263	PAE 1700
TEAM MEMBERS	H. Savile, K. Mollon	DATE 82/01/22
ECS PROGRAM	Water Management Research	
ACTIV ELEM	General	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

1. To prepare for the complete conversion of stocks, machines, standards and practices from Imperial to ISO Metric in Equipment R&D.
2. To connect the deadweight pressure tester to a metric device to be completed by 31/3/83.

Relevance:

Gradual conversion of non S.I. measurements and machines is required to conform to Metrication Program of the Government.

Work Outline:

1. Review changes still outstanding.
2. Acquire conversion equipment and parts.
3. Acquire conversion tools and instruments.
4. Acquire training aids and apply.
5. Supervise hard conversion.

STUDY TITLE	Advancement of Current Metering Wave Orbital Motion Simulator	DIV OR ORG HD
KEY WORDS	Instrumentation, current meter	SEC'N OR GRP ENSRVS
STUDY LEADER	Savile, H. TEL: 637-4311	PAE 1700
TEAM MEMBERS	E. Harrison	DATE 82/01/22
ECS PROGRAM	Water Management Research	
ACTIV ELEM	General	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

To devise and manufacture a device which permits evaluation of instruments working in a variable unsteady fluid flow by March 1983.

Relevance:

The behaviours and inaccuracies of standard and special current meters are poorly understood when orbital and turbulent motions of the water or mooring are concerned. Research activities require reliable and correct measurements in zones where waves and unsteady currents occur.

Work Outline:

1. Specify and procure a programmable controller.
2. Design and procure the support and drive devices and sub-assemblies.

STUDY TITLE	Instrument Calibration Maintenance Laboratory	DIV OR ORG HD
KEY WORDS	Maintenance, calibration, instrumentation, stores, projectionist	SEC'N OR GRP ENSRVS
STUDY LEADER	Mollon, K. TEL: 637-4297	PAE 1700
TEAM MEMBERS	L. Peer, J. Thomson, R. Desrosiers, E. Harrison	DATE 82/01/22
ECS PROGRAM	Water Management Research	
ACTIV ELEM	General	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

1. To continue the maintenance and calibration of common user instrumentation and equipment through efficient use of specialty skills where required.
2. To update general test equipment and eliminate obsolete instruments.
3. To maintain stores and projectionist duties at CCIW.
4. To improve equipment and methods where it is straightforward and economical.
5. To train a new employee to be proficient at instrument maintenance.

Relevance:

Accurate calibration of instruments is essential for all measurements. Scientific and monitoring programs depend on regular and efficient calibration. Instruments must be maintained for efficiency and effectiveness.

Work Outline:

1. Maintain the following classes of gear: meteorology packs sensors, chart recorders; special sensors and systems; ECSG test and calibration gear; and main auditorium audio visual equipment.
2. Maintain electronic stores and assist to maintain mechanical stores.
3. Provide projectionist services for main auditorium.
4. Purchase test instruments and facilities to enhance the capability of the maintenance work such as increased reliability of equipment.
5. Transfer maintenance knowledge and train personnel in new systems or instruments.
6. Keep up the calibration facility for electrical standards, temperature, optics, humidity, conductivity, compass direction and oxygen.

NATIONAL WATER RESEARCH INSTITUTE

Study Plan

NO: 82-373

STUDY TITLE	PILP Involvement/Lisle-Metrex	DIV OR ORG HD
KEY WORDS	Program for Industrial Laboratory Projects (PILP), technology transfer	SEC'N OR GRP ENSRVS
STUDY LEADER	Watson, A.S. TEL: 637-4262	PAE 1700
TEAM MEMBERS		DATE 82/01/22
ECS PROGRAM	Water Management Research	
ACTIV ELEM	General	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

To reach successful conclusion in stable, dissolved-oxygen probe contract with Lisle Metrix by March 1983.

Relevance:

PILP (Program Industry/Laboratory Project) is a national initiative to stimulate Canadian industry and improve national productivity. This study supports the DOE PILP plan.

Work Outline:

To prepare a plan for continuing or ending the present Lisle-Metrex contract. If appropriate, continue to monitor the contract and evaluate the company's performance.

STUDY TITLE	PILP/Involvement/Moniteq	DIV OR ORG HD
KEY WORDS	Program for industrial-laboratory projects, technology transfer	SEC'N OR GRP ENSRVS
STUDY LEADER	Desrosiers, R. TEL: 637-4262	PAE 1700
TEAM MEMBERS	A. Pashley	DATE 82/01/22
ECS PROGRAM	Water Management Research	
ACTIV ELEM	General	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

To be advisor to the PILP Project Manager in the case of the Moniteq/NRC contract.

Relevance:

PILP is the acronym for Program for Industry-Laboratory Project.

The general mandate for these activities comes from the policies created to stimulate Canadian industry. This project supports the DOE.

Work Outline:

To be advisor to the PILP Project Manager in the case of the Moniteq/NRC contract.

STUDY TITLE	Flood Forecasting Ice Undersurface Observation	DIV OR ORG HD
KEY WORDS	Flood forecasting, ice,	SEC'N OR GRP ENSRVS
STUDY LEADER	Valdmanis, J. TEL: 637-4293	PAE 1700
TEAM MEMBERS	G. Dolanjski	DATE 82/1/22
ECS PROGRAM	Water Management Research	
ACTIV ELEM	General	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

Produce a device for observing the characteristics of the underside of river ice cover for winter 1982-82.

Sub-goal for 1981-82:

Decide what medium is best for observing under-ice characteristics and procure major components by fiscal year end 1981-82.

Relevance:

The Forecast Centre and River Ice Committee of Environment New Brunswick (Mr. J.G. Lockart, Director) requested development (File 1438-1).

The characteristics of the under surface of an ice sheet can have considerable effect on the river flow coefficients.

Work Outline:

1. Set the requirements.
2. Complete a literature search on optical properties of river water in winter.
3. Decide on best approach to the problem.
4. Start procurement on equipment for the device.
5. Start assembly.
6. Send progress reports to J.G. Lockart.

STUDY TITLE	Flood Forecasting Ice Thickness Measuring	DIV OR ORG HD
KEY WORDS	Flood forecasting, ice, instrumentation	SEC'N OR GRP ENSRVS
STUDY LEADER	Watson, A.S. TEL: 637-4263	PAE 1700
TEAM MEMBERS	Dr. Beltaos, G. Dolanjski	DATE 82/01/22
ECS PROGRAM	Water Management Research	
ACTIV ELEM	General	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

To obtain and test in the field an instrument or instruments to measure and record the thickness of floating ice on rivers by March 1983.

Relevance:

The instrument was requested by the Forecast Centre and River Ice Committee of Environment, New Brunswick (Mr. J.G. Lockart, Director - File No. 1438-1). The thickness of river ice is an important variable in jamming and flood statistics.

Work Outline:

1. Set statement of requirements and desirable features.
2. Search for instruments and experience.
3. Decide upon the most-suitable instrumentation. Provide justification in an interim report, prior to hardware phase. Make presentation to MOE, NB for their review and concurrence.
4. Set up rentals and loans of equipment.
5. Carry out field trials.
6. Send progress report to J.C. Lockart.

STUDY TITLE	Flood Forecasting, Frazil Ice Recorder	DIV OR ORG HD
KEY WORDS	Flood Forecasting, ice, frazil ice	SEC'N OR GRP ENSRVS
STUDY LEADER	Ford, J.S. TEL: 637-4280	PAE 1700
TEAM MEMBERS	R. Roy, P. Carney, M. Pedrosa	DATE 82/01/22
ECS PROGRAM	Water Management Research	
ACTIV ELEM	General	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

To produce a working prototype of a Frazil Ice Recorder for field use and install it in the field for winter 1982-83.

Relevance:

The forecast Centre and River Ice Committee of Environment New Brunswick (Mr. J.G. Lockart, Director) requested development. (File 1438-1). The characteristics of the under surface of an ice sheet can have considerable effect on the river flow coefficients.

Work Outline:

1. Set statement of requirements by agreement with New Brunswick colorimetric method.
2. Carry out literature search.
3. Set system specification.
4. Send program reports to J.G. Lockart.

NATIONAL WATER RESEARCH INSTITUTE		Study Plan	NO: 82-379
STUDY TITLE	Engineering and Technical Support to Others		DIV OR ORG HD
KEY WORDS	Engineering Services		SEC'N OR GRP ENSRVS
STUDY LEADER	Ford, J.S.	TEL: 637-4280	PAE 1700
TEAM MEMBERS	Various, according to need		DATE 82/01/22
ECS PROGRAM	Water Management Research		
ACTIV ELEM	General		

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

To provide engineering services to the following non-NWRI organizations; GLBL, OAS, EPS, WQL, Canadian Wildlife, Lands, Water Surveys and Water Levels.

Relevance:

Other DOE units do not have adequate support and the engineering support is provided by NWRI. Support to other Departments is on the basis of quid pro quo.

Work Outline:

To provide all classes of engineering and technical skills to solve problems in the non-IWD sectors. This does not include drafting services./

STUDY TITLE	Field Tape Translator (SCRIBE) Part I - SEDWG	DIV OR ORG HD
KEY WORDS	Equipment, instrumentation	SEC'N OR GRP ENSRVS
STUDY LEADER	Harrison, E. TEL: 637-4310	PAE 1700
TEAM MEMBERS	G. Dolanjski, K. Mollon	DATE 82/01/22
ECS PROGRAM	Water Management Research	
ACTIV ELEM	General	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

By fiscal year end, complete the transcriber portion of the Field Tape Translator (SCRIBE), and hand system over to Computer Services.

Relevance:

The present PDP-8 based syustem, plus the supplementary Sea Data System are not in a satisfactory state for production runs of magnetic field tape. Furthermore, the system cannot be improved without a major redesign and rebuilding. A new system is essential to improve efficiency of operations.

Work Outline:

1. Complete the Geodyne tape reading portion.
2. Complete the Plessey tape reading portion.
3. Design and document software for the above.
4. Design the manipulation and output software.
5. Document and demonstrate the system.

STUDY TITLE	Retrofit RCM-12 Current Meters - SEDWG		DIV OR ORG HD
KEY WORDS	Current meters, instrumentation		SEC'N OR GRP ENSRVS
STUDY LEADER	Valdmanis, J.	TEL: 637-4293	PAE 1700
TEAM MEMBERS	J. Ford, F. Boyce, J. Bull		DATE 82/01/22
ECS PROGRAM	Water Management Research		
ACTIV ELEM	General		

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

To demonstrate the reliability of the present retrofitted current meters by July 1982. To study the economics of pursuing the retrofitting to the end. To recommend best action by December 1982.

Relevance:

Certain current meters are preferred for NWRI research because of their characteristics that reject interferences by waves. Several studies rely on accurate estimates of mean water velocities. The present stock of current meters have worn out and the RCM-12's were to replace some of them. However, the problems with the RCM-12's have been sufficiently bad to place them in jeopardy of being classed uneconomical compared to newer alternatives (Grundy 9021). This study will settle the matter.

Work Outline:

1. Carry out one more field trial and check data return.
2. Study costs/benefits or pursuing the retrofit option vs other options.
3. Make a final report and recommendation on the retrofit procedure.

STUDY TITLE	G VAPS Cable Redesign and Test - SEDWG	DIV OR ORG HD
KEY WORDS	Profiling system, equipment, instrumentation, current meter	SEC'N OR GRP ENSRVS
STUDY LEADER	Roy, F.E. TEL: 637-4311	PAE 1700
TEAM MEMBERS	P. Carney, D. Whyte, E. Harrison	DATE 82/01/19
ECS PROGRAM	Water Management Research	
ACTIV ELEM	General	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

Within the fiscal year, to complete modifications and repairs of equipment arising from 1981 operations, including replacement of the mooring cable, to demonstrate the reliability of the system in general field operation as part of the Lake Ontario Coastal Study, 1982, and to clean up equipment at the end of the season. Also to collect and document further experience on mooring forces/wave climate. This study does not include collection and processing of coastal study 1982 data.

Relevance:

The state-of-the-art for producing arrays for measuring current profilers in lakes has not reached a point where limnological research of this type is affordable. Instead, a device for automatically moving a current meter vertically must be used to approximate the array. The prototype of this system exists, except for a reliable mooring cable which carries the signals to the surface for logging. The system will provide current data as a function of time and depth. Current data is essential to develop theories, models or information of dispersion in lakes.

Work Outline:

1. Complete the refurbishment of the G VAPS buoy.
2. Complete the assembly of the new mooring cable subsystem.
3. Deploy the system until mid September 1982.
4. Analyse strain data and form a report.
5. Update the documentation of the system.

STUDY TITLE	Met Pack II, Field Trials - SEDWG	DIV OR ORG HD
KEY WORDS	Meteorology, instrumentation, Great Lakes	SEC'N OR GRP ENSRVS
STUDY LEADER	Valdmanis, J. TEL: 637-4293	PAE 1700
TEAM MEMBERS	G. Dolanjski, R. Boucher	DATE 82/01/19
ECS PROGRAM	Water Management Research	
ACTIV ELEM	General	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

1. By October 1982, complete the field testing of an up-to-date meteorology system which works off a medium scale buoy.
2. To effect improvements for full-use field commissioning for the 1983 field season.
3. To complete the final documentation and reporting by fiscal year end.

Relevance:

Data collection in the Great Lakes and elsewhere depends heavily on an efficient system to measure meteorological and limnological and variables.

Work Outline:

1. Complete the prefield testing of the system.
2. Continue test processes at the dockside and in the field.
3. Translate and evaluate satellite and tape records.
4. Make changes to the system where necessary.
5. Write system documentation.
6. Issue report on progress with a formal paper in mind.

STUDY TITLE	Winch for Surveillance Profiling	DIV OR ORG HD
KEY WORDS	Surveillance, profiling system, equipment	SEC'N OR GRP ENSRVS
STUDY LEADER	Pashley, A. TEL: 637-4263	PAE 1700
TEAM MEMBERS		DATE 82/01/19
ECS PROGRAM	Water Management Research	
ACTIV ELEM	General	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

1. To follow-up and complete the procurement of a profiling winch to be used for surveillance work.
2. To tent and install the winch and
3. To complete the documentation of the above by fiscal year end.

Relevance:

The demand for a high reliability winch for routine work like surveillance requires specialized engineering skills to ensure that the winch will be acceptable.

Work Outline;

1. Complete the bid/negotiation process.
2. Oversee the contractees' work.
3. Produce acceptance tests and review the results.
4. Provide for installation work.
5. Document the winch with a manual.

STUDY TITLE	Sekerka Oxygen Probe (Mechanical) - SEDWG	DIV OR ORG HD
KEY WORDS	Oxygen, dissolved, profiling system instrumentation	SEC'N OR GRP ENSRVS
STUDY LEADER	Roy, F. TEL: 637-4656	PAE 1700
TEAM MEMBERS	I. Sekerka	DATE 82/01/21
ECS PROGRAM	Water Management Research	
ACTIV ELEM	General	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

Based on the favourable results to-date of bench tests with a breadboard, high speed/high resolution, dissolved oxygen sensor, it is intended to continue the laboratory development of a prototype field test probe. This development of the probe, suitable for field trials, will be completed within the fiscal year.

Relevance:

The existing method of dissolved oxygen determinations, using the Rosette sampler plus titration analyses, gives only discrete values at the sampling points in the water column. Other in-situ sensors have been applied to continuous profiling, but tend to be too slow for on-station measurements during surveillance cruises.

Bench tests with the Sekerka probe indicate that a fast response instrument can be developed, to permit rapid/high resolution profiling of dissolved oxygen on a routine basis.

Work Outline

1. Assist in mechanical changes required through the laboratory test phase.
2. Document the changes.

STUDY TITLE	Engineering and Technical Support to NWRI	DIV OR ORG HD
KEY WORDS	NWRI, support	SEC'N OR GRP ENSRVS
STUDY LEADER	Ford, J.S. TEL: 637-4280	PAE 1700
TEAM MEMBERS	Various, according to need	DATE 82/02/08
ECS PROGRAM	Water Management Research	
ACTIV ELEM	General	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

To provide engineering services to the following organizations of NWRI:

Director's Office

Hydraulics Division

Analytical Methods Division

Aquatic Physics & Systems Division

Technical Operations Division

Environmental Contaminants Division

Aquatic Ecology Division

Relevance:

Engineering Services Section was created to provide service to the research program of NWRI.

Work Outline:

To provide all classes of engineering and technical skills to solve problems in NWRI. This does not include drafting services.

AQUATIC ECOLOGY DIVISION

SECTION	STUDY	STUDY TITLE	STUDY LEADER

	DIVISION	AQUATIC ECOLOGY DIVISION RESEARCH MANAGEMENT AND ADMINISTRATION	BARICA, J.
	AQUATIC WEEDS	NUTRIENT EXCHANGE PROCESSES IN MACROPHYTE LAKES	CARIGNAN, R.
*	475	HYDROGEN SULFIDE INHIBITION OF EURASIAN WATERMILFOIL	CARIGNAN, R.
*	476	CONTROL OF EURASIAN WATERMILFOIL	PAINTER, S.
*	477	AQUATIC MACROPHYTES, ACID LAKES AND METALS	PAINTER, S.
*	478		PAINTER, S.
*	479	CLADOPHORA IN THE GREAT LAKES	
	ECOLOGICAL IMPACT	EFFECT OF LAKE ACIDIFICATION ON SEDIMENT TRACE METALS REMOBILIZATION	CARIGNAN, R.
*	405	TAXONOMY, ECOLOGY, PALEOLIMNOLOGY OF FRESHWATER OSTRACODES	DELORME, L. D.
*	406	INFERENCE ABOUT CHANGE IN A SET OF OBSERVATIONS	ESTERBY, S. R.
*	407	STATISTICAL ANALYSES OF PALEOECOLOGICAL DATA	ESTERBY, S. R.
*	408	EFFECT OF LAKE ACIDIFICATION ON CYCLING OF ORGANIC MATTER	BOURBONNIERE, R. A.
*	410	PB-210 GEOCHRONOLOGY AND TRACE METAL BUDGETS OF SOFTWATER LAKES	WONG, H. K. T. / NRIAG
*	411	STABLE ISOTOPE STUDY OF THE SULFUR CYCLE IN ACID LAKES	NRIAG, J. O.
*	412	LONG-RANGE TRANSPORT OF AS AND HEAVY METALS FROM SMELTING OPERATIONS	ARAFAT, N.
*	413	HUDON/JAMES BAY COASTAL ECOLOGY	GLOOSCHENKO, W. A.
*	414	WETLANDS OF CANADA BOOK	GLOOSCHENKO, W. A.
*	415	IMPACT OF PEAT AS AN ENERGY SOURCE UPON NORTHERN AQUATIC ECOSYSTEMS	GLOOSCHENKO, W. A.
*	416	PALEOLIMNOLOGY OF ACID SUSCEPTIBLE LAKES	DELORME, L. D.
*	418	BIOGEOCHEMICAL PROCESSES IN GREAT LAKES SEDIMENTS - PALEOENVIRONMENT	BOURBONNIERE, R. A.
*	419	SEDIMENT BANK - GREAT LAKES	BOURBONNIERE, R. A.
*	495		IAGU, J. O.
	GREAT LAKES	LAKE ERIE HISTORICAL OXYGEN AND PHOSPHORUS TREND ANALYSIS	ROSA, F.
*	420	SEDIMENTATION RATES AND NUTRIENT PROCESSES IN LAKE ONTARIO, 1981	ROSA, F.
*	421	LAKE ERIE	BURNS, N. M.
*	422	BENTHIC INVERTEBRATES AS INDICATORS OF ENVIRONMENTAL CHANGE	KALAS, L. L.
*	423	GREAT LAKES WATER CHEMISTRY ATLAS	DOBSON, H. F. H.
*	424	PRODUCTION, DECOMPOSITION AND SEDIMENTATION IN LAKE ONTARIO	CHARLTON, M. N.
*	425	ORGANIC MATERIAL PRODUCTION AND DECOMPOSITION (LAKE ERIE)	CHARLTON, M. N.
*	426	THE NEPHELOID LAYER IN LAKE ONTARIO	SANDILANDS, R. G.
*	428	BIOAVAILABILITY OF PHOSPHORUS	MANNING, P. G.
*	430	SCIENTIFIC PHOTOGRAPHY	BOOTH, W. G.
*	451	SPAWNING/NURSERY GROUND SURVEYS	SLY, P. G.
*	480	CHEMICAL SPECIATION AND BIOAVAILABILITY OF TOXIC ELEMENTS	LUM, K. R.
*	481	LAKE ERIE SURVEILLANCE CONTINUITY	CHARLTON, M. N.
*	497		
	NUTRIENT PATHWAYS	AQUATIC NITROGEN CYCLE	BROWNLEE, B.
*	431	ASSIMILATION OF ORGANIC COMPOUNDS IN A POLLUTED STREAM	BROWNLEE, B.
*	432	BIOAVAILABILITY OF PHOSPHORUS IN LAKE WATER	BURNISON, B. K.
*	433	FUNCTION OF HIGH MOLECULAR WEIGHT "DOC" IN LAKE WATER	BURNISON, B. K.
*	434	PHYSIOLOGICAL IMPACT OF ORGANIC COLLOIDAL FIBRILS IN LAKE WATERS	LEPPARD, G. G.
*	436	MANIPULATION OF ALGAL PRODUCTIVITY BY PRECIPITATION OF PHOSPHATE	MURPHY, T.
*	437	LAKE ECOSYSTEM NUTRIENT PROCESS INVESTIGATIONS	LEAN, D. R. S.
*	438	LAKE RESTORATION BY HYPOLIMNETIC AERATION	LEAN, D. R. S.
*	439	LAKE ONTARIO NUTRIENT ASSESSMENT STUDY (LONAS)	LEAN, D. R. S.
*	494		

STUDY TITLE	Aquatic Ecology Division Research Management and Administration	DIV OR ORG AED
KEY WORDS	Management, administration,	SEC'N OR GRP AEDDIV
STUDY LEADER	Barica, J. TEL: 637-4227	PAE 1715
TEAM MEMBERS	J. Major, F. Boyd (SSD)	DATE 82/02/10
ECS PROGRAM	Water Management Research	
ACTIV ELEM	Aquatic Ecology	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

1. Plan, organize, manage and control scientific programs and studies of the Aquatic Ecology Division.
2. Provide scientific leadership in formulation and direction of research studies and ensure their utility to Departmental needs.
3. Provide liaison between AED, other NWRI Divisions and outside government/non government organizations to ensure efficient approach to the solution of Departmental problems and needs.
4. Provide administrative services to ensure efficient operation of the Division and optimum allocation of resources.

STUDY TITLE	Effect of Lake Acidification on Sediment Trace Metals Remobilization	DIV OR ORG AED
KEY WORDS	LRTAP, acid rain, trace metals, sediments	SEC'N OR GRP EMPACS
STUDY LEADER	Carignan, R. TEL: 637-4602	PAE 4300
TEAM MEMBERS	Nriagu, J.O.	DATE 82/02/10
ECS PROGRAM	M.R.C. - LRTAP	
ACTIV ELEM	Long Range Transport of Airborne Pollutants - Aquatic	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

To measure in situ the release of trace metals from lake sediments undergoing acidification, and to investigate the chemical mechanisms involved.

Relevance:

One of the observed effects of lake acidification is the increase of pollutant trace metals concentrations in the water. In this study, the role of sediments in supplying trace metals to the overlying water will be evaluated in situ for lakes exhibiting various degrees of acidification. Any remobilization process within the sediments or across the sediment-water interface will be best reflected in the pore water composition. The focus of this study will thus be to relate pH to trace metal concentration and behaviour in sediment pore water.

Work Outline:

1. Develop a suitable technique for in situ sampling of pore water trace metals by dialysis. (April - May 82.)
2. Sediments and pore waters will be sampled twice (spring turnover and late summer) in lakes showing a wide pH range, possibly in the Turkey Lakes area or Sudbury area. (May - September 82.)
3. Our observations will be analyzed in light of the existing thermochemical models for the species of interest and the impact of acidification on undisturbed lake sediments will be evaluated. (October - January 82.)

NATIONAL WATER RESEARCH INSTITUTE		Study Plan	NO: 82-406
STUDY TITLE	Taxonomy, Ecology, Paleolimnology of Freshwater Ostracodes		DIV OR ORG AED
KEY WORDS	Paleolimnology, ecology, climate		SEC'N OR GRP EMPACS
STUDY LEADER	Delorme, L.D.	TEL: 637-4382	PAE 1715
TEAM MEMBERS	S.R. Esterby N.S. Harper		DATE 82/02/10
ECS PROGRAM	Water Management Research		
ACTIV ELEM	Aquatic Ecology		

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

Completion and finalization of previous research: this study is designed to complete a number of manuscripts which have either been begun or need to be written up.

Relevance:

Manuscripts on ostracode taxonomy, paleoenvironmental interpretations, and aquatic ecology are the final phase of research that has been undertaken.

Work Outline:

1. Scanning electron microscopy of modern ostracodes from the Yukon and Northwest Territories, Ontario-Quebec, and the Great Lakes. This work depends on the availability of a SEM. (April-December.)
2. To complete a manuscript on "Ecological significance of sensitivity indices for benthic ostracodes in Lake Erie." (December)
3. Service work done at the request of colleagues from universities and other government institutes both nationally and internationally. (Continuing.)

STUDY TITLE	Inference About Change in a Set of Observations	DIV OR ORG AED
KEY WORDS	LRTAP, trends, statistical modelling, surveillance acid rain	SEC'N OR GRP EMPACS
STUDY LEADER	Esterby, S.R. TEL: 637-4362	PAE 1715
TEAM MEMBERS		DATE 82/02/10
ECS PROGRAM	Water Management Research	
ACTIV ELEM	Aquatic Ecology	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

Review statistical procedures for the determination of change in a set of observations, with the purpose of writing a report on the use of these procedures in the fields of water research. The questions of existence of a trend or the occurrence of an intervention frequently arise. The intention is to make suitable procedures available in the form of a report which uses illustrative examples from the field.

Relevance:

The present purpose is to provide a more unified approach. The objective will be met by analysing sets of data. These will include i) surveillance data from the Great Lakes, ii) water quality data on rivers from the set identified for trend assessment by the Water Quality Branch and iii) diatom concentrations in lake sediment cores used to assess the pH history of lakes susceptible to acid rain.

Work Outline:

1. Review statistical methods (September, 1982).
2. Analyze sets of data to evaluate methods, (by September, 1982).
3. Write a report(s) from results of steps 1 and 2, (March, 1983).

STUDY TITLE	Statistical Analyses of Paleocological Data	DIV OR ORG AED
KEY WORDS	Paleolimnology, ecology, statistical modelling	SEC'N OR GRP EMPACS
STUDY LEADER	Esterby, S.R. TEL: 637-4362	PAE 1715
TEAM MEMBERS	L.D. Delorme	DATE 82/02/10
ECS PROGRAM	Water Management Research	
ACTIV ELEM	Aquatic Ecology	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

By statistical analysis, determine the empirical relationship between the presence or absence of a species and the variables which describe its habitat for an autecological data base of shelled invertebrates. Review designs and present methods of determining this empirical relationship for paleoecological studies from the statistical point of view.

Relevance:

The success of the study depends upon the efficacy of the empirical relationship (sometimes called the calibration). Results of this project, which deals with the problem of determining such a relationship, will be of use in other paleoecology studies.

Work Outline:

1. Completion of the analysis of the subset of data corresponding to the Saskatchewan stations by March 1983. (Computer programs for future use will not be developed.)
2. Review of calibration methods by December, 1982.

STUDY TITLE	Effect of Lake Acidification on Cycling of Organic Matter	DIV OR ORG AED
KEY WORDS	Acid lakes, LRTAP, geochemistry, organics	SEC'N OR GRP EMPACS
STUDY LEADER	Bourbonniere, R.A.	TEL: 637-4382 PAE 4300
TEAM MEMBERS	Term Assistant	DATE 82/02/10
ECS PROGRAM	M.R.C. - LRTAP	
ACTIV ELEM	Long Range Transport of Airborne Pollutants - Aquatic	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

1. To develop a diagnostic test to separate natural acidification from cultural acidification.
2. To investigate naturally-occurring organic components in shield lakes which which are biochemical markers of ecological change.
3. To determine the effect of lake acidification on the cycling of organic matter in shield lakes.

Relevance:

Acidification has led to important ecological changes in shield lakes. Such changes affect the character, distribution and stability of organic matter residing in the various compartments of these freshwater ecosystems. Modification of the cycling of organic matter can in turn lead to further ecological changes.

Work Outline:

1. Determine bulk organic composition and geolipid distributions from Sudbury and Algonquin samples collected in FY 81/82.
2. Quantify changes throughout annual cycle and down core.
3. Examine lipid distributions for potential biochemical markers of ecological change.
4. Prepare manuscript on preliminary survey work.

STUDY TITLE	PB-210 Geochronology and Trace Metal Budgets of Softwater Lakes	DIV OR ORG AED
KEY WORDS	Acid rain, LRTAP, lead, geochronology, heavy metals, sediments	SEC'N OR GRP EMPACS
STUDY LEADER	Wong, H.K.T./Nriagu, J.O. TEL: 637-4547	PAE 4300
TEAM MEMBERS	R.D. Coker, P. Dillion (OME), Student	DATE 82/02/10
ECS PROGRAM	M.R.C. - LRTAP	
ACTIV ELEM	Long Range Transport of Airborne Pollutants - Aquatic	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

a) To measure the (total) deposition of trace metals in selected lakes in northern Ontario and to establish an accumulative metal budget with reference to atmospheric input; b) to correlate the lake metal inventory with deposition per unit area in the region; c) to assess the changes in atmospheric loading of trace metals and other pollutants by relating the historical record of source emission to records in recent sediments; d) to evaluate the short and long term effects of acid precipitation together with metal enrichment in these softwater lakes.

Relevance:

Lead-210 provides a unique index for determining a) the source and behaviour of lead and other heavy metals in natural waters; b) dating past pollution episodes as recorded in the sediment column of freshwater environments. Information from lead-210 measurements can also be used in calculating geochemical and sediment budgets.

Work Outline:

1. Field work will include one or two softwater lakes located NW of Sudbury, Ontario. Sampling will include a) sediment cores, 2) water, 3) suspended particulates (sediment traps); as well as on site measurements (May-Sept.).
2. Laboratory analysis of water, suspended particulates and sediments collected from Algonquin Park lakes during 1980-82 to be completed. Trace elements and major ions by WQB, other analysis such as Pb-210 analysis will be done by AED personnel (continuous).
3. Compilation of 1981/82 study results and conclusions for publication, this includes any LRTAP reports if required.
4. An additional task is planned subject to the availability of one COSEP student (0.3 P/Y). Title of additional study is "Distribution of Heavy Metals in Interstitial Waters from Sudbury Area Lakes".

STUDY TITLE	Stable Isotope Study of the Sulfur Cycle in Acid Lakes	DIV OR ORG AED
KEY WORDS	LRTAP, acid rain, sulfur, pollution, selenium, arsenic, atmospheric deposition, sediments	SEC'N OR GRP EMPACS
STUDY LEADER	Nriagu, J.O. TEL: 637-4252	PAE 4300
TEAM MEMBERS	R.D. Coker	DATE 82/02/10
ECS PROGRAM	M.R.C. - LRTAP	
ACTIV ELEM	Long Range Transport of Airborne Pollutants - Aquatic	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

- a) Assess the environmental significance of variations in the isotopic composition of sulfur in waters, suspended particulates and sediments of acid lakes around the smelters at Sudbury; b) compare the similarities and differences in the cycling of pollutant sulfur and selenium in the study lakes.

Relevance:

Sulfur isotope studies can provide important information on the sources, dispersion pathways and ultimate sink of the pollutant sulfur in a lake basin. The sulfur cycle is closely linked to the problem of acid rains and lake acidification; many lakes in the park are now showing signs of acid stress.

Work Outline:

1. Analyses of the sediment, water and suspended particulate samples collected during the 1981/82 field season will be completed by the end of the coming fiscal year.
2. Additional samples of suspended particulates will be obtained from four soft-water lakes near Sudbury by means of sediment traps during the summer of 1982. Samples will be analyzed for total sulfur, selenium, arsenic, organic-C and organic-N. The isotopic composition of the sulfur in the suspended particulate samples will also be determined. The data should provide additional insight into the flux rates for the chemical pollutants in the study lakes.

STUDY TITLE	Long-range Transport of Arsenic and Heavy Metals from Smelting Operations	DIV OR ORG AED
KEY WORDS	Atmospheric deposition, arsenic, heavy metals, geochemistry, LRTAP, pollution, sediments	SEC'N OR GRP EMPACS
STUDY LEADER	Arafat, N. TEL: 637-4602	PAE 4200
TEAM MEMBERS	W.A. Glooschenko, N. Harper	DATE 82/02/10
ECS PROGRAM	M.R.C. - Toxic Substances	
ACTIV ELEM	Toxic Substances	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

To establish and characterize the relationship between arsenic and other heavy metals from lake sediments due to atmospheric fallout of pollutants in mining and smelting area of northern Canada (Rouyn-Noranda, Que.), to investigate the environmental impact of fallout from these sources.

Relevance:

Arsenic among other potentially toxic metal is released into the atmosphere by smelting operations in northern Canada from smelters such as Sudbury, Ont. and Rouyn-Noranda, Que. Previous studies have shown increased concentrations of these elements in bog vegetation surrounding these smelters - Rouyn is a major source of atmospheric pollution in northern Quebec, yet no work has been previously done on atmospheric emission of metals and arsenic from this site.

This study will determine the environmental impact of Rouyn compared to Sudbury, an intensively studied site.

Work Outline:

1. Literature search. (April-May)
2. Core collection, processing geochemistry analysis (June, July and September).
3. Data analysis and reduction (October, November and December).
4. Report/paper preparation (December, January, February).

STUDY TITLE	Hudson/James Bay Coastal Ecology	DIV OR ORG AED
KEY WORDS	Hudson Bay, James Bay, ecology, sediments, geochemistry, wetlands, impact	SEC'N OR GRP EMPACS
STUDY LEADER	Glooschenko, W.A. TEL: 637-4229	PAE 1715
TEAM MEMBERS	R.I.G. Morrison (CWS), I.P. Martini, R.D. Protz (Univ. Guelph)	DATE 82/02/10
ECS PROGRAM	Water Management Research	
ACTIV ELEM	Aquatic Ecology	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

To complete investigation of the sensitivity of coastal wetlands in the Hudson Bay lowlands with respect to future possible developments, and to wrap up previous field experiments.

Relevance:

To supply an understanding of sedimentological and ecological processes to allow future planning, development and protection of the shore/coastal zone of Hudson and James Bays.

Work Outline:

The study will investigate the ecology of coastal areas by: 1) investigating the major physico-chemical factors of soils and sediments influencing the species composition, biomass, and productivity of coastal vegetation and benthic invertebrates with emphasis upon salt marsh communities; 2) determining both the qualitative and quantitative distribution of coastal vegetation in terms of species composition and biomass, with particular emphasis upon species important to wildlife; 3) studying major geochemical cycles in such environments; 4) developing a predictive model to determine the possible effect of environmental perturbations upon coastal ecology.

During 1982/83 final analysis and preparation of reports in cooperation with Drs. I.P. Martini and Dr. R.I.G. Morrison, CWS-Ontario Region will be completed. Several reports are planned, with emphasis upon coastal ecology, ecosystem development in the HBL, and on management aspects. Several scientific papers will also be prepared for publication during 83/?.

STUDY TITLE	Wetlands of Canada Book	DIV OR ORG AED
KEY WORDS	Wetlands, ecology, ecosystem, impact	SEC'N OR GRP EMPACS
STUDY LEADER	Glooschenko, W.A. TEL: 637-4229	PAE 1715
TEAM MEMBERS		DATE 82/02/10
ECS PROGRAM	Water Management Research	
ACTIV ELEM	Aquatic Ecology	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

To produce a book on wetlands ecology with emphasis on the Canadian environment (in cooperation with the National Wetlands Working Group).

Relevance:

Wetlands are extremely productive aquatic ecosystems and important fish and wild-life habitats. However, they are susceptible to environmental degradation. Such a publication would aid managers and planners in decision making.

Work Outline:

1. This book is now in a preliminary draft form and additional information is necessary before a satisfactory first draft is completed (end of 1982). Gaps in knowledge of wetlands of Atlantic Canada need to be filled first, and
2. a field trip will be made in cooperation with Lands Directorate, Atlantic Region, this summer for this purpose (July-August). Following the field trip chapters will be prepared on coastal wetlands in cooperation with National Wetland Working Groups members from CFS, CWS, and LD.
3. Plans will be made for the upcoming Wetlands of Canada Research Symposium to be held in 1984 in cooperation with Univ. of Guelph and DOE (CWS, CFS, LD, IWD).

STUDY TITLE	Impact of Peat as an Energy Source Upon Northern Aquatic Ecosystems	DIV OR ORG AED
KEY WORDS	Energy production, ecology, environmental impact statements, acid rain, LRTAP	SEC'N OR GRP EMPACS
STUDY LEADER	Glooschenko, W.A. TEL: 637-4229	PAE 1715
TEAM MEMBERS	R.A. Bourbonniere, N. Arafat, V. Glooschenko (Ont. Ministry of Nat. Resources)	DATE 82/02/10
ECS PROGRAM	Water Management Research	
ACTIV ELEM	Aquatic Ecology	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

To determine the impact of peat extraction for energy upon aquatic ecosystems, both lakes and streams.

Relevance:

The large-scale use of peat for energy production is being proposed in Ontario. Little is known on the ecology of acidic wetlands (bogs and fens) in terms of their effect upon water quality of nearby lakes and streams. This would allow an understanding of wetland food chains, productivity (both algal and benthic invertebrates) and how wetland biota interacts with water bodies including lakes and streams. Such a study would also develop possible indicator species of acidification such as rhizopods, algae, and invertebrates, and enable our understanding of the role of peatlands in natural acidification processes in lakes and streams.

Work Outline:

1. Literature review (August, 1982).
2. Collection of cores and surface samples from local acid wetlands to assess local historical changes in peat chemistry and accumulation rate with reference to contaminants.
3. Attend DOE Peat Committee meetings.
4. Identify and enumerate algal and invertebrate components of local peat.

STUDY TITLE	Paleolimnology of Acid Susceptible Lakes	DIV OR ORG AED
KEY WORDS	LRTAP, Paleolimnology, acid rain, algae, ecology	SEC'N OR GRP EMPACS
STUDY LEADER	Delorme, L.D. TEL: 637-4382	PAE 4300
TEAM MEMBERS	S.R. Esterby, N.S. Harper, H. Duthie (Univ. of Waterloo), Tech. Ops.	DATE 82/02/10
ECS PROGRAM	M.R.C. - LRTAP	
ACTIV ELEM	Long Range Transport of Airborne Pollutants - Aquatic	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

To delineate, with a time framework of the last 200 years, the changes in hydrogen ion concentrations, within a given lake, using fossils.

Relevance:

This study is proposed for the LRTAP program to assess whether or not a given lake is naturally acidic or whether the acidity has come predominantly from anthropogenic sources.

Work Outline:

- Study II Diatom analyses, 4 cores, contract. To be completed by January 1983.
Study VI Interpretation of results. To be completed by March 1983.
Study VII Autecology of diatoms. Continuing field work in the Algoma area. Will collect modern diatoms and do chemical analyses of in situ lake waters, particularly pH, alkalinity. This will provide the information required to determine the pH interpretive model for fossil diatoms from cores.
Ref. Davies and Del Prete.

STUDY TITLE	Biogeochemical Processes in Great Lakes Sediments - Paleoenvironment	DIV OR ORG AED
KEY WORDS	Biogeochemistry, paleolimnology, impact, sediments	SEC'N OR GRP EMPACS
STUDY LEADER	Bourbonniere, R.A./Nriagu, J.O. TEL: 637-4382/4252	PAE 1715
TEAM MEMBERS	T. Mayer, J. Mothersill (Lakehead U.), C. Carmichael (U.W.Ont.) J. Robbins (NOAA, Ann Arbor), S. Eisenreich (U. Minn.)	DATE 82/02/10
ECS PROGRAM	Water Management Research	
ACTIV ELEM	Aquatic Ecology	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

1. To relate biogeochemical changes recorded in Great Lakes sediments to paleoenvironmental conditions.
2. To determine present and historical fluxes of organic and inorganic components in high sedimentation rate areas of each of the Great Lakes.
3. To model time-dependent input and subsequent mobilization and transformation processes.

Relevance:

This study relates to the international effort to rehabilitate and manage the Great Lakes basin. We must build upon knowledge of paleoenvironmental events in order to understand the significance and ecological impact of present-day and future geochemical events.

Work Outline:

1. Sediment sampling by box, piston and gravity coring; Lake Erie and Lake St. Clair; piggy-backed on Sediment Bank Cruise. Cruise samples shared with cooperating scientists as appropriate. (cont.)
2. Complete lipid analyses from 1981 Lake Ontario box cores. (cont.)
3. Begin lipid analyses of Lake Ontario piston core samples. (April-June)
4. Begin lipid analyses of Lake Erie box core samples (June-July)
5. Determine profiles of major and minor elements in two cores; relate changes to paleoenvironmental events. (Dec.)
6. Meet with cooperating scientists to discuss results and begin manuscript preparation. (cont.)

STUDY TITLE	Lake Erie Historical Oxygen and Phosphorus Trend Analysis	DIV OR ORG AED
KEY WORDS	Oxygen, dynamics, phosphorus, trends, Lake Erie, hypolimnion	SEC'N OR GRP GRLICS
STUDY LEADER	Rosa, F. TEL: 637-4506	PAE 1715
TEAM MEMBERS	N.M. Burns	DATE 82/02/10
ECS PROGRAM	Water Management Research	
ACTIV ELEM	Aquatic Ecology	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

1. Write a report on the Lake Erie oxygen depletion rate trend from 1929 to 1980.
2. To analyse phosphorus concentration data in Lake Erie from 1970 to 1980, to see if there is a concentration change with time and relate this to phosphorus loadings to the lake.

Relevance:

1. There exists a seasonal variability in the hypolimnetic oxygen depletion rates. An attempt will be made to attribute this variability to either physical, chemical and/or biological processes to distinguish the variability due to these processes and that due to the trophic state of the lake.
2. Eutrophication in Lake Erie is believed to be mainly due to phosphorus enrichment. This premise led to the Can.-U.S. Agreement to reduce "P" loading to the lake. Loadings have been reduced somewhat, but is there a parallel reduction of phosphorus in the lake also?

Work Outline:

1. A significant amount of the Lake Erie oxygen data has been analysed. The complete analysis of oxygen depletion rates to be finalized and published. (August 1982).
2. To process available phosphorus data from Canadian and U.S. data bases, and to write a report on the changes of concentrations in Lake Erie from 1970 to 1980 (March 1983).

STUDY TITLE	Sedimentation Rates and Nutrient Processes in Lake Ontario, 1981	DIV OR ORG AED
KEY WORDS	Trends, Lake Ontario, sediments, suspended materials surveillance	SEC'N OR GRP GR LICs
STUDY LEADER	Rosa, F. TEL: 637-4506	PAE 1715
TEAM MEMBERS	N.M. Burns, R. Sandilands	DATE 82/02/10
ECS PROGRAM	Water Management Research	
ACTIV ELEM	Aquatic Ecology	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

1. To produce a summary report, which should reveal the short term (weekly) variability in sedimentation processes at limnologically different sites in Lake Ontario.
2. To determine the spatial and temporal variability in chemical constituents in Lake Ontario 1981. Project in cooperation with Proj. No. 81-FR-BL-099 (GLBL-DFO).

Relevance:

1. Since the majority of organic contaminants are associated with particulate material, this report will aid in the understanding of their movements and implications in the aquatic system and may be related to the food chain.
2. If only four sampling stations, instead of whole lake surveys are proven to be sufficient to describe lake-wide changes for long-term surveillance plans; considerable savings will be achieved in our present monitoring programs.

Work Outline:

1. The sedimentation trap data collected in Lake Ontario in 1981 at four major sites will be analyzed and processed. The analyses will be done for the different stratas in the water column, and also for different particle sizes for selected samples (April-November).
2. The temporal and spatial variability of chemical constituents in Lake Ontario measured at four different sites from April to November will be studied. The variability of these constituents based on four sites monitored weekly and whole lake surveys monitored monthly will be compared, assessed and reported (March 1983).

NATIONAL WATER RESEARCH INSTITUTE

Study Plan

NO: 82-422

STUDY TITLE	Lake Erie; Past, Present and Future	DIV OR ORG AED
KEY WORDS	Lake Erie, technology transfer, information, public, management	SEC'N OR GRP GR LICS
STUDY LEADER	Burns, N.M. TEL: 637-4246	PAE 1715
TEAM MEMBERS		DATE 82/02/10
ECS PROGRAM	Water Management Research	
ACTIV ELEM	Aquatic Ecology	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

To submit for publication a book in 1982 outlining the changes in the lake basin and in Lake Erie from 1700 to the present, and the most important options open for improving the lake by reversing the actions which led to degradation of the lake.

Relevance:

The main purpose of writing this book is to inform the Canadian public and concerned groups of the situations leading to the degradation of Lake Erie and of the actions necessary to restore Lake Erie to a satisfactory state. This information should increase the support of the general public for lake improvement programs.

Work Outline:

1. To rewrite and edit the whole manuscript and submit it for publication.
(December 1982.)

STUDY TITLE	Benthic Invertebrates as Indicators of Environmental Change	DIV OR ORG AED
KEY WORDS	Surveillance, benthos, eutrophication, Great Lakes, Lake Ontario	SEC'N OR GRP GR LICS
STUDY LEADER	Kalas, L.L. TEL: 637-4389	PAE 1715
TEAM MEMBERS	M. Charlton, cruise members	DATE 82/02/10
ECS PROGRAM	Water Management Research	
ACTIV ELEM	Aquatic Ecology	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

1. To collate data on small scale distribution of benthic organisms including Oligochaeta, Crustacea, Insecta and Mollusca in western Lake Ontario.
2. To identify changes in diversity sustaining mechanism, specimen abundance, aggregation, patchiness and other biological parameters caused by impact of the pollution sources, phosphorus loading reduction and impending climatic change on lake biotic communities.

Relevance:

Measurement of biological parameters on macrobenthos in western Lake Ontario will help clarify the effect of the Niagara River. Diagnosing the spatial patterns and temporal ecological changes foreseen in the lake biota and water quality fits in with current work on the Project Niagara.

Work Outline:

1. To initiate the chronological inventory of the western Lake Ontario benthic fauna based on literature review and existing samples (April-October 1982).
2. To design, construct and test an elutriation apparatus in cooperation with Engineering Section. (July 1982.)
3. To carry on the ecobenthological surveillance sampling along six transects with 46 stations between Weller and Wilson including the mouth of the Welland Canal, Port Dalhousie, the Niagara River and Niagara Bar slope - twice a year, in collaboration with M. Charlton's and ECD cruises (April-October 1982).
4. To submit a progress report evaluating data from 1982 ecobenthological surveillance cruises and outline the more specific plan for 1983 (December 1982).

STUDY TITLE	Great Lakes Water Chemistry Atlas	DIV OR ORG AED
KEY WORDS	Lake Ontario, Lake Erie, atlas, water quality, nutrients, plankton, oxygen	SEC'N OR GRP GRLICS
STUDY LEADER	Dobson, H.F.H. TEL: 637-4506	PAE 1103
TEAM MEMBERS		DATE 82/02/10
ECS PROGRAM	Canada-U.S. and Interprovincial Waters	
ACTIV ELEM	Surveillance/Monitoring	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

To produce a descriptive atlas of distribution and trends for the period of observations 1966-1982, first (Vol. 1) for Lake Ontario and second (Vol. 2) for Lake Erie, with emphasis on nutrients, particulate organic matter, oxygen and major ions.

Relevance:

Lakes Ontario and Erie have been intensively measured by CCIW since 1966; the data have to be displayed and conclusions drawn. The lakes are important to Canada, the U.S. and 22 million people, many of whom use the lakewater for drinking.

Work Outline:

- | | |
|-----------------------------|--------------------------------------|
| 1. Volume 1: (Lake Ontario) | Submit for publication by June 1982, |
| 2. Volume 2: (Lake Erie) | Data processing: July 82-March 83. |

STUDY TITLE	Production, Decomposition and Sedimentation in Lake Ontario	DIV OR ORG AED
KEY WORDS	Sediments, nutrients, contaminants, decomposition,	SEC'N OR GRP GRLICS
STUDY LEADER	Charlton, M.N. TEL: 637-4589	PAE 1715
TEAM MEMBERS	W.G. Booth, J. Carey, B. Oliver, M. Fox, M. Whittle	DATE 82/02/10
ECS PROGRAM	Water Management Research	
ACTIV ELEM	Aquatic Ecology	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

1. To measure sedimentation and regeneration rates of nutrients and contaminants in Lake Ontario and relate these to changes in loading, standing stock, and phytoplankton production.
2. To relate sediment trap catches to accumulation rates in the lake.
3. To determine the fate of material loaded by the Niagara River as an aspect of inshore-offshore water quality differences.

Relevance:

The Niagara River is a major source of nutrients and contaminants to Lake Ontario. By studying the fate of these loaded materials we will attack questions relating to phytoplankton response to loading changes and the effect of eutrophication on contaminant movement. Work begun at the Niagara River and Western Lake Ontario will be extended to east central Lake Ontario in conjunction with the LONAS study of D. Lean.

Work Outline:

1. Repair existing sediment traps and construct 10 new assemblies (May 1982).
2. Refurbish traps, collect water samples, measure primary production, transmission/temp/cond. surveys every 3-4 weeks March to November - auxilliary work in December and March 82 is possible.
3. Analysis of sediments for nutrients, metals and organic contaminants.
4. Exchange of samples with A. Mudroch, ECD, for XRF and electron microprobe analysis.
5. Calculation of process rates and implications and report preparation.
(Preliminary report at IAGLR meeting May 1982, full report in May 1984.)

STUDY TITLE	Organic Material Production and Decomposition (Lake Erie)	DIV OR CRG AED
KEY WORDS	Algal growth, decomposition, sediments, oxygen dynamics, Lake Erie	SEC'N OR GRP GR LICs
STUDY LEADER	Charlton, M.N. TEL: 637-4589	PAE 1715
TEAM MEMBERS	W.G. Booth, D.R.S. Lean	DATE 82/02/10
ECS PROGRAM	Water Management Research	
ACTIV ELEM	Aquatic Ecology	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

To investigate and characterize the carbon cycle in Lake Erie by determining the algal growth, maintenance (respiration) and decomposition rates in the epilimnion of Lake Erie. To calculate net water column organic production and compare this to sedimentation, oxygen depletion, nutrient cycles and water quality. Conclusion of AED80-035.

Relevance:

The fate of organic matter produced in lakes is central to the appearance and quality of lake water. This program will be useful for lake modelling and management by developing further knowledge of the eventual effect of nutrient loading on oxygen conditions and overall lake water quality.

Work Outline:

1. Analysis of samples collected in 1978, 79, 80 and preparation of data reports. (August)
2. Preparation of final reports on production respiration and sedimentation.
3. Study to be completed by March 1983.

STUDY TITLE	The Nepheloid Layer in Lake Ontario	DIV OR ORG AED
KEY WORDS	Sediments, Lake Ontario, suspended materials	SEC'N OR GRP GRLICS
STUDY LEADER	Sandilands, R.G. TEL: 637-4547	PAE 1715
TEAM MEMBERS	A. Mudroch	DATE 82/02/10
ECS PROGRAM	Water Management Research	
ACTIV ELEM	Aquatic Ecology	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

To map and sample the nepheloid layer in Lake Ontario throughout the year to investigate its activity and its relationship with other lake processes.

Relevance:

Resuspension of fine-grained lake sediments may allow any bound contaminants to be released into the water column and be available for biological uptake. The nepheloid layer may be related to resuspension, but more work is required to determine its mineral composition and physical characteristics.

Work Outline:

Field work in 1981 showed that the nepheloid layer exists over large areas of the lake and with a considerable thickness, at least during the late summer and fall. Continue this work to obtain a full year of data.

1. Obtain EBT and transmissometer data to the lake bottom from the surveillance cruises plus any additional data available (May-October).
2. Prepare a report by March 1983 on the occurrence and composition (particles, organic matter) of the nepheloid layer in Lake Ontario.

STUDY TITLE	Bioavailability of Phosphorus	DIV OR ORG AED
KEY WORDS	Phosphorus, availability, iron, sediments	SEC'N OR GRP GRICS
STUDY LEADER	Manning, P.G. TEL: 637-4707	PAE 1715
TEAM MEMBERS	T. Mayer	DATE 82/02/10
ECS PROGRAM	Water Management Research	
ACTIV ELEM	Aquatic Ecology	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

To advance knowledge of P-Fe relationships in abatement of eutrophication through:

1. Determination of brown amorphous $\text{Fe}(\text{OH})_3$ and NAIP concentrations in Lake Erie and Lake Ontario muds, using Mossbauer and chemical extraction methods (ongoing program).
2. Determination of $\text{Fe}(\text{OH})_3$ and NAIP concentrations in muds from the Bay of Quinte and collation with water O_2 and P.

Relevance:

Brown amorphous $\text{Fe}(\text{OH})_3$ is probably the main binder of NAIP and of bioavailable P in oxic sediments. The Mossbauer method is non-destructive and affords a useful check on the validity of destructive chemical extraction methods. The Mossbauer-derived $\text{Fe}(\text{OH})_3$ concentrations should indicate the sediment-NAIP binding capacity.

Work Outline:

1. Lake Erie muds will be Mossbauered under contract by Dr. T. Birchall, McMaster University (October-December 1982). Sediment cores will be retrieved before and after turnover (September). Results will be collated with NAIP, XRD and water chemistry data (by March 1983).
2. Initial studies will begin of $\text{Fe}(\text{OH})_3$ and NAIP levels in Bay of Quinte muds. The bay is a good example of a eutrophic body of water (initial results by January 1983).
3. Sudbury lake muds spectra will be re-computed with the aid of Dr. Trickes, (U.K.). (March 1983.)

STUDY TITLE	Aquatic Nitrogen Cycle	DIV OR ORG AED
KEY WORDS	Ammonia, toxicity, nitrogen, eutrophication, pollution	SEC'N OR GRP NUPROS
STUDY LEADER	Brownlee, B. TEL: 637-4221	PAE 1715
TEAM MEMBERS	G.A. MacInnis	DATE 82/02/10
ECS PROGRAM	Water Management Research	
ACTIV ELEM	Aquatic Ecology	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

To obtain information on sources and fate of ammonia-nitrogen in lakes and streams, in particular, ones which are highly eutrophic or heavily polluted. Specific objectives for 1982/82 are to test the feasibility of developing an ammonia model for polluted streams, as outlined in the Long term Operational Plan, and to determine the short-term fate of ammonia in lakes using N-15 tracer (with T.P. Murphy).

Relevance:

Ammonia, the central species in the aquatic nitrogen cycle, is a nutrient in lakes and streams. As well, at high concentrations and at higher pH, it can be toxic to aquatic animals. The study of ammonia cycling will lead to a better understanding of the fate of this potential toxicant in aquatic systems. The emphasis in streams will be on studying nitrification, a natural process which removes ammonia by oxidation and can reduce the potential threat to aquatic animals. The N-15 experiment will address a serious gap in our knowledge of the short-term fate of ammonia in lakes, and test the possibility that organic nitrogen compounds are important intermediates in the aquatic nitrogen cycle.

Work Plan:

1. Manuscript preparation on 1978-79 Lake Erie nitrogen cycle studies.
2. Preliminary work on an N-15 method for measuring nitrification rates (by October/82).
3. Field testing of a memory-storage data logger for continuous recording of dissolved oxygen, temperature and pH (August to October/82). Ammonia assimilation will be estimated from oxygen production and C/N ratios.
4. Monthly sampling of Canagagigue Creek for nutrients and major ions and monitoring of incident solar radiation by Technical Operations (May to October/82).
5. N-15 enclosure experiment in Yellow Lake pothole near Penticton, B.C., June/82.

STUDY TITLE	Assimilation of Organic Compounds in a Polluted Stream	DIV OR ORG AED
KEY WORDS	Nutrients, Organics, Pollution, Streams	SEC'N OR GRP NUPROS
STUDY LEADER	Brownlee, B. TEL: 637-4221	PAE 1715
TEAM MEMBERS	G.A. MacInnis	DATE 82/02/10
ECS PROGRAM	Water Management Research	
ACTIV ELEM	Aquatic Ecology	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

The goal is to describe the general processes by which Canagagigue Creek, as a representative polluted stream, recovers from a nutrient/organic loading, and to test for nutrient/organic interactions. Specific objectives for 1982/83 are: (1) qualitative and quantitative analyses of the major organic compounds in suspended sediment samples collected in 1982; (2) estimation of in situ biodegradation rates of 2-(methylthio)benzothiazole and the effects of temperature and dissolved oxygen on these rates; and (3) establishment of a time-of-travel vs flow correlation for the creek.

Relevance:

Canagagigue Creek receives effluent from the Elmira sewage treatment plant which processes both municipal and industrial waste, resulting in a loading of nutrients and synthetic organic compounds to the creek. Water quality is degraded below the outfall, but recovers markedly when the creek joins the Grand River some 8 km downstream. This location offers an excellent opportunity to study recovery processes. This study is conducted in collaboration with an ECD study (J. Carey, M. Fox, and J. Metcalfe) and is coordinated with ongoing work by EPS, MOE, and the Grand River Conservation Authority. Water quality in Canagagigue Creek is also of concern to the Waterloo Region as they are drawing water from the Grand River downstream from the confluence with the creek.

Work Plan:

- (1) Sediment analyses have begun and will require several months to complete.
- (2) Biodegradation measurements will be made monthly from May to October by bottle experiments and in aquaria containing stones from the creek with attached periphyton.
- (3) Time-of-travel will be determined monthly from May to October. This is done by Technical Operations by conductivity measurements on samples taken with automatic samplers, by using floats, and by dye tracking.

STUDY TITLE	Bioavailability of Phosphorus in Lake Water	DIV OR ORG AED
KEY WORDS	Phosphorus, bioavailability, bioassay	SEC'N OR GRP NUPROS
STUDY LEADER	Burnison, B.K. TEL: 637-4706	PAE 1715
TEAM MEMBERS	D.J. Nuttley	DATE 82/02/10
ECS PROGRAM	Water Management Research	
ACTIV ELEM	Aquatic Ecology	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

To develop a sensitive bioassay for dissolved available phosphate in lake water as a measure of the total phosphorus fraction which is available to living micro-organisms (bacteria and algae).

Relevance:

One of the major voids in our knowledge of phosphorus loadings to any body of water is still: "What portion of the phosphorus is available to the microorganisms for nutrient requirements?" Algal bioassays are not sensitive and chemical methods are too destructive (acidic conditions). Also, the chemical fractionation schemes have not been adequately supported by biological assays.

Work Plan:

1. A suitable microorganism will be isolated from nature, which possesses a phosphate affinity constant of 1 microgram P/litre, by the end of June.
2. A chemostat will be used to maintain this organism in the logarithmic state.
3. The kinetic values for the bioassay organism's phosphate transport system will immediately be determined using ^{32}P isotope techniques.
4. During the summer 82/83, lake water filtrates will be inoculated with this organism and changes in the transport kinetics monitored. The measured change is indicative of the available phosphate concentration in the lake water.

STUDY TITLE	Function of High Molecular Weight "DOC" in Lake Water	DIV OR ORG AED
KEY WORDS	Fibrils, organics, metals	SEC'N OR GRP NUPROS
STUDY LEADER	Burnison, B.K. TEL: 637-4706	PAE 1715
TEAM MEMBERS	G.G. Leppard and D.J. Nuttley J. Carey, Y.K. Chau (ECD)	DATE 82/02/10
ECS PROGRAM	Water Management Research	
ACTIV ELEM	Aquatic Ecology	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

To determine the role of the high molecular weight (HMW) organic colloids in the aquatic environment, with emphasis on the metal-binding capacity of the colloidal fractions isolated from lake water (as stated in the Long-Term Operational Plan).

Relevance:

Previous research (AED-80-36, P-29-32, PRD-ND 3A&B) has shown the ubiquity of these materials in lake water, sediment traps and sediments. The past year's study (AED-81-434) has shown a successful isolation of these HMW colloids from lake water and I have obtained four fractions by chemical precipitation. Thorough analyses of these fractions will be needed before we can study other lakes.

Work Outline:

1. Laboratory experiments will continue during the whole fiscal year on determining the purity of the various HMW fractions.
2. Preliminary experiments to measure the metal binding capacity of Lake St. George water and the various HMW fractions will run from June to September (in cooperation with Y.K. Chau, ECD).
3. Preliminary tests will be made on Lake Ontario (Niagara River) to determine the presence of organic contaminants in the colloidal fraction of the lake water (June to September, in cooperation with J. Carey, ECD).

STUDY TITLE	Physiological Impact of Organic Colloidal Fibrils in Lake Waters	DIV OR ORG AED
KEY WORDS	Fibrils, lake water, physiology, organics	SEC'N OR GRP NUPROS
STUDY LEADER	Leppard, G.G. TEL: 637-4232	PAE 1715
TEAM MEMBERS	B.K. Burnison, D. Paolini	DATE 82/02/10
ECS PROGRAM	Water Management Research	
ACTIV ELEM	Aquatic Ecology	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

To ascertain the physiological functions in lake water of natural organic colloidal "fibrils" of 3-10 nm diameter. The first subgoal, the development of a method to obtain fibril fractions of high purity from lake water, was achieved in 1980, with improved purification techniques being tested in 1981 in conjunction with the related project of Dr. B.K. Burnison. The 1981 subgoal of assaying fibril fractions for their binding of mineral nutrients was begun and is now ongoing. An improved assay system for routine binding studies should be ready in 1982 as should some limnologically-relevant binding data.

Relevance:

The fibrils were an important component of 97% of water samples from a 10-lake survey carried out from 1977 to 1982 by NWRI. In 55% of these samples, the fibrils were the single most abundant organic material seen, with improved quantitation giving figures indicating that fibril levels can be as high as 35% of the mass of "dissolved" organic carbon. Circumstantial evidence implicates them in flocculation phenomena and important ion-binding phenomena and as the major adhesive of microbial communities. The sequential pursuit of 5 subgoals leading to an understanding of the impact of the fibrils on lake physiology is outlined in study AED-80-36 which is the progenitor of this study.

Work Outline:

- 1) To overcome a flaw in methodology, namely the solution chemistry aspect of applying trace elements to fibril preparations in binding studies - to be done in conjunction with Dr. Burnison from April 82 - March 83.
- 2) To continue preliminary studies on fibril binding of phosphate, iron and copper using fibril fractions, (isolated from St. George Lake from July to Sept. of 1982) with these studies running from July 82 to March 83.
- 3) To edit a book on trace element speciation - this activity will be interspersed with those above from April 82 to July 82.

STUDY TITLE	Manipulation of Algal Productivity by Precipitation of Phosphate	DIV OR ORG AED
KEY WORDS	Phosphorus, management, algae, precipitation,	SEC'N OR GRP NUPROS
STUDY LEADER	Murphy, T. TEL: 637-4221	PAE 1715
TEAM MEMBERS	B.G. Brownlee, A. Mudroch, R.J. Daley, K.J. Hall (U.B.C.), A. Tautz (Fish and Wildlife, B.C.)	DATE 82/02/10
ECS PROGRAM	Water Management Research	
ACTIV ELEM	Aquatic Ecology	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

The coprecipitation of phosphate with calcium carbonate (calcite will be studied to determine the impact of this precipitation reaction on phosphate availability and algal productivity. The induction of calcite formation by nitrate enrichment will be also evaluated as a potential method of reducing summer algal blooms in hypertrophic lakes. Preliminary work will be done on Lake Ontario to determine if calcium carbonate-phosphate reactions are present and if they significantly alter the P regime of the Great Lakes.

Relevance:

Phosphorus is the major nutrient regulating algal growth, calcite formation is common in hardwater lakes ("whittings" or "marl"), and the calcite-phosphate coprecipitation has been observed in an earlier study (AED-80-37). A better understanding of this precipitation may permit better modelling of phosphate fluxes in hardwater lakes. Induction of calcite formation could reduce phosphate availability and could be a cost-effective method of curtailing excessive algal growth. The form of N utilized by microbes greatly affects the pH and carbonate solubility, thus the proposed method of inducing calcite formation, nitrate enrichment, is relevant to N cycling and waste disposal.

Work Plan:

Most of the experiments would be done on Yellow Lake, B.C., because it has an extremely high phosphate concentration and a moderate alkalinity. This work will be done in cooperation with U.B.C. and the Fish and Wildlife Branch of B.C. In late April to mid-May we will set up a simple field station and enclosures in the lake. From mid-June to mid-August experimental manipulations of nitrogen availability, pH, calcite solubility, and algal productivity will be conducted. Sample analysis and data evaluation will proceed until December. An early draft of the results will be available in March, 1983.

STUDY TITLE	Lake Ecosystem Nutrient Process Investigations	DIV OR ORG AED
KEY WORDS	Nutrients, bacteria, algal growth, phosphorus availability	SEC'N OR GRP NUPROS
STUDY LEADER	Lean, D.R.S. TEL: 637-4589	PAE 1715
TEAM MEMBERS	K. Edmondson, A. Abbott	DATE 82/02/10
ECS PROGRAM	Water Management Research	
ACTIV ELEM	Aquatic Ecology	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

To establish interrelationships between nutrients (nitrogen and phosphorus), their form and bioavailability, algal growth and the organisms that are sustained by the algal production (bacteria, protozoa, and zooplankton), and to evaluate the role of sediments in lake nutrient metabolism. Since toxic materials can alter the community and this in turn alters the nutrient flows, they will be considered in the investigations as well.

Relevance:

This project attempts to answer the critical questions about phosphorus and nitrogen processes in lake ecosystems. These results will provide a greater insight on lake ecosystem response to nutrient removal.

Work Outline:

1. To continue writing up experiments conducted in the past years (3-6 reports during 82/83.
2. To continue research (possibly with a PDF and Visiting Scientist plus other university collaborators) on the interrelationships of nutrient uptake, algal growth, and zooplankton response.
3. Further experiments on the assimilation of nitrate, often resulting from acid rain, including denitrification (with R. Knowles, McGill University). Work will be done principally at Lake St. George.
4. Experiments using basin budgets of forms of C, N, and P as well as oxygen and other substances in lakes will be used to develop relationships to predict a lakes trophic state from internal loading of nutrients from sediments. These later estimates are based on peeper profiles (see proposal of R. Carignan, AED). Experiments will be conducted at several lakes recently studied where reliable data exist principally for water chemistry, bathymetry, and oxygen depletion.
5. The influence of toxic substances on nutrient cycling will be assessed in large enclosures at Lake St. George in collaboration with University of Guelph personnel (Soloman and Kaushik).

STUDY TITLE	Lake Restoration by Hypolimnetic Aeration	DIV OR ORG AED
KEY WORDS	Phosphorus, nitrogen, eutrophication, hypolimnion,	SEC'N OR GRP NUPROS
STUDY LEADER	Lean, D.R.S. TEL: 637-4589	PAE 1715
TEAM MEMBERS	K. Edmondson, in collaboration with Dr. D. McQueen, York University, S. Rao (ECD)	DATE 82/02/10
ECS PROGRAM	Water Management Research	
ACTIV ELEM	Aquatic Ecology	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

To test hypotheses that phosphorus and nitrogen cycling is influenced by hypolimnetic aeration; to assess this lake restoration method and its use for rehabilitation of small lakes in recreational areas.

Relevance:

Many lakes have deteriorated so that algal blooms persist throughout the summer. Many of these can be dramatically improved by a low-cost aeration method.

Work Outline:

1. 1st year baseline monitoring is now complete. Operation will begin May 1982. The response will be monitored for the next two years.
2. Preliminary evaluation of 1982 exp. data in March 1983.

STUDY TITLE	Scientific Photography	DIV OR ORG AED
KEY WORDS	Photography	SEC'N OR GRP GRLICS
STUDY LEADER	Booth, W.G.	TEL: 637-4589 PAE 1715
TEAM MEMBERS		DATE 82/02/10
ECS PROGRAM	Water Management Research	
ACTIV ELEM	Aquatic Ecology	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

To provide photographic materials, equipment, processing, consultation and scientific photography for Divisional studies.

Relevance:

Centralizing purchasing of photographic materials and needs for the Division maximizes savings by bulk ordering and simplifies accounting.

Single Inventory Holder of Divisional photographic equipment allows maximum usage and availability of limited resources to all Division members.

Difficult or unique photographic problems or needs funnelled through an individual with the expertise or contacts to solve them eliminates unnecessary time spent by individuals not familiar with the profession.

Work Outline:

1. Order bulk requirements, (film chemicals, enlarging papers) through Standing Offer Agreements. (Continuing.)
2. Maintain complete inventory of photo equipment on card file. (Continuing.)
3. Maintain photo account by petty cash through CHA Film Club for photo-finishing and local photo store for small accessory purchases. (Continuing.)
4. Keep working relationships with other groups in CCIW and outside agencies to solve photo problems and needs of scientific research for Division. (Continuing.)

STUDY TITLE	Nutrient Exchange Processes in Macrophyte Lakes	DIV OR ORG AED
KEY WORDS	Macrophytes, nutrients, sediments	SEC'N OR GRP AQWEED
STUDY LEADER	Carignan, R. TEL: 637-4252	PAE 1710
TEAM MEMBERS	Student	DATE 82/02/10
ECS PROGRAM	Water Management Research	
ACTIV ELEM	Aquatic Weeds	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

To evaluate the effect of aquatic macrophyte growth on sedimentation processes and nutrient release from sediments.

Relevance:

Preliminary studies have shown that the rate of internal loading of nutrients by diffusive flux from the sediments is an important component of total nutrient loading in small, relatively shallow lakes. This component is usually insignificant in the littoral zone because sedimentation rates and hence, nutrient regeneration from the sediments, are small. However, normal sedimentation processes are totally disrupted in littoral zones colonized by macrophytes. Macrophytes act as a turbulence barrier which increases sedimentation and nutrient regeneration. The study will thus focus on a quantification of this increased diffusive loss of nutrients from the sediments due to the presence of macrophytes.

Work Outline:

To illustrate the significance of internal loading due to increased nutrient regeneration in sediments colonized by aquatic weeds, several lakes with and without weeds will be selected. Sedimentation rates will be measured by sediment traps and by ^{210}Pb lead dating. Between May and September, sediment pore water nutrients will be measured and nutrient fluxes will be calculated from the observed concentration gradients. Finally, the collected data will be used to generate a model linking sedimentation rate to nutrient regeneration in the sediments. Progress report by December 1982.

STUDY TITLE	Hydrogen Sulfide Inhibition of Eurasian Watermilfoil	DIV OR ORG AED
KEY WORDS	Eurasian milfoil, weeds, macrophytes	SEC'N OR GRP AQWEED
STUDY LEADER	Carignan, R.	TEL: 637-4252 PAE 1710
TEAM MEMBERS	S. Painter	DATE 82/02/10
ECS PROGRAM	Water Management Research	
ACTIV ELEM	Aquatic Weeds	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

To establish a relationship between H₂S levels in sediments and milfoil growth and physiological status.

Relevance:

Although submersed macrophyte growth appears to be principally controlled by sediment nutrient availability, extensive macrophyte-free areas can be found in eutrophic sediments occurring in lakes where macrophyte development has reached nuisance levels. Without a good understanding of the natural causes behind these mysterious declines of milfoil populations, the effects of weed control strategies (harvesting, poisoning, etc.) cannot be properly evaluated. Preliminary work at Buckhorn and Chemung Lakes has shown that the absence of milfoil is associated with high H₂S levels in the sediments. This observation suggests that H₂S is toxic to Eurasian water milfoil.

Work Outline:

1. Development of a multiple sulfide electrode (August 1982).
2. Test the electrode in the field (sulfide profiles in sediments) on at least 10 stations in Buckhorn and Chemung Lakes (October, 1982)
3. Data analysis and reporting (January 1983).

STUDY TITLE	Control of Eurasian Watermilfoil	DIV OR ORG AED
KEY WORDS	Weeds, marcophytes, Eurasian milfoil, herbicides, distribution, nutrients	SEC'N OR GRP AQWEED
STUDY LEADER	Painter, S. TEL: 637-4251	PAE 1710
TEAM MEMBERS	J. Wood	DATE 82/02/10
ECS PROGRAM	Water Management Research	
ACTIV ELEM	Aquatic Weeds	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

- 1. To conduct applied research in infestation of recreational and navigable water bodies by indigenous and exotic species of aquatic weeds, for the purpose of developing and assessing effective strategies to prevent, control or eliminate the degradation of recreational water use, and/or to counter their adverse effect on navigation and river conveyance characteristics.
- 2. To develop an ecologically sound control technology for nuisance aquatic weeds.
- 3. To determine the environmental impact of herbicide treatment.
- 4. To identify the importance of carbon, nitrogen and phosphorus in the growth of Eurasian milfoil.
- 5. To document the distribution of Eurasian watermilfoil in Quebec and aid the Province of Quebec in the development of a sound control program

Relevance

Nuisance aquatic plants are infesting many provincial and national water bodies in Quebec, Ontario, Manitoba, Saskatchewan, Alberta and British Columbia. Tourism in Ontario CORTS corridor (400 million) and the Okanagan Valley, BC (400 million) is dramatically affected. International Waters and Interprovincial waters such as the St. Lawrence R., Ottawa R., L. Memphremagog, L. Champlain, Osoyoos L. and the Trent, Severn, Rideau waterway are affected. The problem of Eurasian watermilfoil is particularly urgent and several provinces have requested help in dealing with the spread and control.

Work Outline:

- 1. Continue Harvesting experiment which is attempting to produce nutrient limited sediments by repeated harvests. Two harvests planned for 1982. Subsequent harvests in later years will depend on results from 1982. Best estimate for expected results is 1983.
- 2. Conduct Herbicide nutrient release impact experiment beginning in April 1982 lab work completed August 82, sample analysis completed Jan. 83, report March 83
- 3. Distribution of Milfoil in Quebec - Contract initiated July 82 completed Nov., 82, received Feb., 83
- 4. Limiting nutrients for Milfoil - Contract initiated April 82, preliminary report March 83. Evaluate if follow-up work required in 83/84.

STUDY TITLE	Aquatic Macrophytes, Acid Lakes and Metals	DIV OR ORG AED
KEY WORDS	LRTAP, acid rain, heavy metals, macrophytes, nickel, copper, zinc	SEC'N OR GRP AQWEED
STUDY LEADER	Painter, S. TEL: 637-4251	PAE 1710
TEAM MEMBERS	J. Wood, N. Arafat	DATE 82/02/10
ECS PROGRAM	Water Management Research	
ACTIV ELEM	Aquatic Weeds	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

Evidence exists that aquatic plants rapidly release carbon and metals such as Zinc, Nickel and Copper from sediments to the water. It is possible that aquatic macrophytes could influence the buffering capacity of an acid lake, productivity of phytoplankton and toxicity of metals to the biota. There is a need to estimate the importance of aquatic macrophytes in metal mobilization and cycling in acid lakes.

Work Outline:

Field Work: To illustrate that the pelagic zone is being enriched with metals and carbon in an acid sensitive lake. Work conducted during June and August, Data analysis in late fall, sample analysis completed by January 83.

Lab Work: Determine mode of release of metals and carbon (i.e., excretion, decay, sediment release) and rate constants under different environmental conditions (i.e., pH) Lab work begins in September concludes in March 83.

STUDY TITLE	Cladophora in the Great Lakes	DIV OR ORG AED
KEY WORDS	Macrophytes, weeds, eutrophication, Great Lakes, models, water quality	SEC'N OR GRP AQWEED
STUDY LEADER	Painter, S. TEL: 637-4251	PAE 1710
TEAM MEMBERS		DATE 82/02/10
ECS PROGRAM	Water Management Research	
ACTIV ELEM	Aquatic Weeds	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

To review literature and develop a predictive model to determine if current water quality objectives will reduce Cladophora abundance and distribution.

Relevance:

Cladophora is perceived as a nuisance by the public in the Great Lakes area because it is a shoreline problem highly evident to the public. The public may feel that the government is not accomplishing nutrient reduction goals that are effective because the Cladophora is not decreasing. The goal of this research is to determine if Cladophora will decline with current water quality objectives.

Work Outline:

1. Review literature (start upon appointment of PDF, hopefully May 1, 1982).
2. Visit current researchers in Great Lakes Cladophora research (literature review and discussions of gaps in information expected to take until Sept.)
3. Evaluate information for model development and identify gaps.
4. Develop simulation model (model development and on line processing expected to take until January or February 1983).
5. Plan experiments (field or lab) to fill gaps and test data base for model verification (March 83, experiments to be conducted in next fiscal year if PDF is extended).

STUDY TITLE	Spawning/Nursery Ground Surveys	DIV OR ORG AED
KEY WORDS -	Great Lakes, Habitat, Bottom Substrates	SEC'N OR GRP GRLICS
STUDY LEADER	P.G. Sly	TEL: 476-6556
TEAM MEMBERS	R.G. Sandilands	PAE 1715
ECS PROGRAM	Water Management Research	
ACTIV ELEM	Aquatic Ecology	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

Refers to Study 82-109

STUDY TITLE	Chemical Speciation and Bioavailability of Toxic Elements	DIV OR ORG AED
KEY WORDS	Availability, mobility, leachability, transport chemical forms, speciation, trace elements	SEC'N OR GRP GRLICS
STUDY LEADER	K.R. Lum TEL: 637-4251	PAE 4200
TEAM MEMBERS	P.G. Manning	DATE 82/4/30
ECS PROGRAM	M.R.C. - Toxic Substances	
ACTIV ELEM	Toxic Substances/Contaminants	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

See ECD Study No. 230

STUDY TITLE	Lake Ontario Nutrient Assessment Study (LONAS)	DIV OR ORG AED
KEY WORDS	Eutrophication, phosphorus, algal growth, sediments,	SEC'N OR GRP NUPROS
STUDY LEADER	Lean, D.R.S. TEL: 637-4589	PAE 1715
TEAM MEMBERS	A. Abbott, K. Edmondson, Visiting Scientist, Tech Ops.	DATE 82/02/10
ECS PROGRAM	Water Management Research	
ACTIV ELEM	Aquatic Ecology	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

To determine the duration and degree of nutrient limitation of algae in Lake Ontario and to estimate its effect on overall water quality and assess its implication on P management strategies (as stated in the Long Term Operational Plan). This involves relating the nutrient data collected during the intensive monitoring of Lake Ontario to physiological indicators of nutrient limitation. Nutrient analysis and biomass estimates will also be made along with selected rate constants to integrate with the study of physical processes (Simons).

Relevance:

Interpretation of nutrient monitoring to assess the duration of nutrient limitation of the Lake Ontario phytoplankton is difficult, but the present study will also provide physiological indicators which may make the monitor data more informative. This study will also show when the biomass is limited by physical and chemical processes.

Work Outline:

Week long cruises (5) will be made to four stations extending on a transect from the shallow zone to monitor station 41 (formerly OOPS 019) where an extensive data base exists from 1971. During 1982-83, measurements of primary production, nutrient uptake, protein synthesis, grazing and excretion rates of zooplankton, and settling rate of particulate C,N and P will be made. Preliminary evaluation of the data will be made by March 83 and a final report will be available by September 83.

STUDY TITLE	Sediment Bank - Great Lakes	DIV OR ORG AED
KEY WORDS	Sediments, Great Lakes, trends, contaminants	SEC'N OR GRP EMPACS
STUDY LEADER	Bourbonniere, R.A. TEL: 647-4382	PAE 1103
TEAM MEMBERS	T. Mayer, D. Liu, B. Van Sickle (term)	DATE 82/02/10
ECS PROGRAM	Water Management Research	
ACTIV ELEM	Aquatic Ecology	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

To establish a bank of Great Lakes sediment samples to permit retroactive analysis in order to establish spatial and temporal trends.

Relevance:

Sediments act as the ultimate sink of many persistent contaminants, both organic and inorganic. In this respect they record contamination events. A bank of Great Lakes sediments will serve as (1) a source of baseline material from which to reference future contamination problems, (2) an integral part of any early warning system and (3) an aid to the understanding of trends in contaminant loadings. The sediment bank fulfils in part requirements under Annex 12, Sections 4(a) and 5(3) of the GLWQA.

Work Outline:

1. This continuing study concentrates on a different one of the Great Lakes each year in a five year cycle. Concentration for 82/83 is Lake Erie.
2. Collect about 1 kg (dry weight) of surficial sediment at each of about 50 stations (June 82).
3. Process all sediments collected for long-term storage (January 83).
4. Determine transient parameters at time of sampling. (June 82).
5. Determine bulk chemical parameters on bank samples. (January 83).

STUDY TITLE	Lake Erie Surveillance Continuity	DIV OR ORG AED
KEY WORDS	Lake Erie, oxygen, chlorophyll, nutrients, bacteria	SEC'N OR GRP GRLICS
STUDY LEADER	Charlton, M.N. TEL: 637-4589	PAE 1715
TEAM MEMBERS	W.G. Booth, S.S. Rao (AMD), A. Jurkovic (AMD)	DATE 82/02/10
ECS PROGRAM	Water Management Research	
ACTIV ELEM	Aquatic Ecology	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

Develop and conduct a simple and inexpensive annual sampling program to provide historical data suitable for the detection of important changes in Lake Erie. This requires the construction of oxygen monitoring apparatus to begin in FY 82-83 in order to begin field work in 83-84. Coordination and planning coordination with GLBL (DFO) and CLEAR (US) to be completed in 82-83.

Relevance:

In the past, interpretation of Lake Erie changes has been hampered by 10-20 year gaps in the data. There is enough variability from year to year to reduce the usefulness of traditional intensive samplings which are conducted sporadically because of expense.

This program will ensure that Canada has a continuous record of the needed information for a minimum expenditure.

Work Outline:

1. Construct dissolved oxygen profiling system for use on CSS Limnos and/or smaller launches; test on 2-3 cruises (in connection with AED 425 and 426) (July 82).
2. Summarize, interpret and report data, make comparisons and modify program (March 83).

AQUATIC PHYSICS and SYSTEMS DIVISION

SECTION	STUDY	STUDY TITLE	STUDY LEADER
DIVISION			
500		DIVISIONAL MANAGEMENT	ELDER, F. C.
582		AQUATIC REGIME ACIDIFICATION MODELS AND MONITORING	THOMPSON, M. E.
583		COORDINATION OF IWD LRTAP PROGRAM	ELDER, F. C.
BASIN INVESTIGATIONS AND MODELLING			
501		OPERATIONAL WATER QUALITY AND CONTAMINANT TRANSPORT MODELS	LAM, D. C. L.
502		STRATIFICATION AND AIR-SEA INTERACTION	SIMONS, T. J.
503		COASTAL EXCHANGE DYNAMICS	SIMONS, T. J.
504		SIMULATION OF TOXIC CONTAMINANTS FATE IN LAKE ONTARIO	HALFON, E.
505		STATISTICAL ANALYSIS OF SURVEILLANCE DATA	EL-SHAARAWI, A.
506		COASTAL EXCHANGE/TRANSPORT MODELS	MURTHY, C. R.
507		AQUATIC REGIME ACIDIFICATION MODELS	LAM, D. C. L.
508		VERTICALLY PROFILING CURRENT METER AND TEMPERATURE SENSOR (GVAPS)	BOYCE, F. M.
509		WATER MOVEMENTS IN THE CENTRAL BASIN OF LAKE ERIE, PHASE III	BOYCE, F. M.
510		LAKE ONTARIO PHYSICAL LIMNOLOGY STUDIES	MURTHY, C. R.
511		ASSESSMENT OF THE PRESENT SURVEILLANCE PROGRAM AND FUTURE STRATEGY	EL-SHAARAWI, A.
512		GREAT LAKES CLIMATIC ATLAS (VOLUME 2)	BOYCE, F. M.
513		WATER QUALITY SIMULATION ON ICE COVERED LAKES	HAMBLIN, P. F.
599		APSD - CAPITAL PROCUREMENT	BULL, J.
DATA MANAGEMENT			
572		WATER QUALITY DATA BASE ADMINISTRATION	DUFFIELD, R.
573		NWRI BRANCH RESEARCH SUPPORT - DATA MANAGEMENT	COMBA, H.
574		NON-NWRI BRANCH RESEARCH PROGRAMMING SUPPORT	COMBA, H.
575		GEWS/UNEP - GLOBAL WATER QUALITY DATA MANAGEMENT	ROGALSKY, J.
ENVIRONMENTAL SPECTRO-OPTICS			
540		SPECTRO-OPTICAL MODELLING AND APPLICATIONS TO WATER RESEARCH	BUKATA, R. P.
541		POLLUTANT TRANSPORT THROUGH POROUS MEDIA	BOBBA, A. G.

NATIONAL WATER RESEARCH INSTITUTE

Study Plan

NO: 82-500

STUDY TITLE	Divisional Management	DIV OR ORG APSD
KEY WORDS	AQUATIC PHYSICS, SYSTEMS ANALYSIS, MODELS, ADMINISTRATION	SEC'N OR GRP APSDIV
STUDY LEADER	Elder, F.C. TEL: 637-4212	PAE 1716
TEAM MEMBERS	S.M. Tapping	DATE 82/02/02
ECS PROGRAM	Water Management Research	
ACTIV ELEM	Aquatic Physics and Systems	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

AQUATIC PHYSICS AND SYSTEMS OVERHEAD

Program Travel

Conference Travel

Training and Development

Divisional Administration

01/01/82

Approval _____

FORM A, PART 1

STUDY TITLE	Operational Water Quality and Contaminant Transport Models	DIV OR ORG APSD
KEY WORDS	ENVIRONMENTAL SIMULATION, OPERATIONAL MODELS, CONTAMINANTS TRANSPORT, WATER QUALITY MODELS, SURVEILLANCE	SEC'N OR GRP BIMS
STUDY LEADER	Lam, D.C.L. TEL: 637-4235	PAE 1716
TEAM MEMBERS	A.S. Fraser, W.M. Schertzer, T.J. Simons	DATE 82/01/29
ECS PROGRAM	Water Management Research	
ACTIV ELEM	Aquatic Physics and Systems	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

- GOALS:** To implement presently available contaminant transport and water quality models in an operational mode with interactive computer facilities for displaying simulation responses to loading control and toxic substances management strategies; to update and upgrade the operational models by integrating recent results of basic disciplinary research and surveillance data.
- RELEVANCE:** Application of operational model in interactive and real time mode facilitates simulation of ecosystem response to water quality and toxic substances management strategies and provides simulated information on aquatic regime dynamics to bridge the gaps in the experimental design, collection and analysis of field data.
- WORK OUTLINE:**
1. To provide water quality models for operational application and management strategies with particular reference to Lakes Erie and Ontario (Fraser, Schertzer, Lam).
 - a) Implement presently available basinwide mass balance models on interactive computer graphic systems (report by March 1983).
 - b) Include statistical variance and confidence level in the model output and loading estimates (by March 1983).
 - c) develop efficient computer algorithms for interactive implementation of models (contract report by March 1983).
 - d) Update climatic influence.
 - e) Upgrade models by incorporating new research results on biochemistry if and when they become available.
 2. To improve spatial simulation in water quality models including advection-diffusion processes (Lam, Simons)
 - a) To apply existing contaminant transport models for Niagara River plume (by March 1983).
 - b) To correlate seasonal variation of plume orientation with seasonal loading information (Report by March 1984).

NATIONAL WATER RESEARCH INSTITUTE

Study Plan

NO: 82-502

STUDY TITLE	Stratification and Air-Sea Interaction	DIV OR ORG APSD
KEY WORDS	ENVIRONMENTAL SIMULATION, CLIMATE, AIR-WATER INTER-ACTION, THERMOCLINE	SEC'N OR GRP BIMS
STUDY LEADER	Simons, T.J. TEL: 637-4218	PAE 1716
TEAM MEMBERS	AES (CCC)	DATE 82/02/03
ECS PROGRAM	Water Management Research	
ACTIV ELEM	Aquatic Physics and Systems	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

- GOALS: To model vertical mass exchanges in large lakes and oceans as a continuation of last year's project 81-1502. To supervise the coupling of an upper ocean model with an atmospheric circulation model at the Canadian Climate Centre.
- RELEVANCE: This study provides a scientific framework for the dual purpose of simulating vertical exchange of nutrients and contaminants in large lakes and modeling climatic interactions between the atmosphere and oceans, as required for the environmental simulation program of NWRI and the Canadian Climate program, respectively.
- WORK OUTLINE: Stratification models developed previously under this project will be coupled with large lake circulation models and water quality models as needed for projects 501 and 503. In addition, experiments will be continued with an upper ocean model designed to run interactively with the atmospheric circulation model of the Canadian Climate Centre. This work will be carried out with the assistance of personnel of the Climate Centre and will require regular travel to Toronto (approximately 2 days/month). Results will be published in report form by March 1983.

STUDY TITLE	Coastal Exchange Dynamics	DIV OR ORG APSD
KEY WORDS	ENVIRONMENTAL SIMULATION, COASTAL ZONE, LAKE ONTARIO NIAGARA RIVER	SEC'N OR GRP BIMS
STUDY LEADER	Simons, T.J. TEL: 637-4218	PAE 1716
TEAM MEMBERS	D.C.L. Lam, W.M. Schertzer, J. Jedrasik	DATE 82/02/03
ECS PROGRAM	Water Management Research	
ACTIV ELEM	Aquatic Physics and Systems	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

- GOALS: To model the hydrodynamics of nearshore zones in large lakes, in particular the northshore of Lake Ontario, the Niagara River plume and its effect on the circulation of the western basin of Lake Ontario. To develop appropriate advanced modeling techniques to remedy short comings of currently available models.
- RELEVANCE: To provide sound scientific knowledge on coastal circulations and transport and dispersion of contaminants in nearshore zones as required for water quality studies and water resources management.
- WORK OUTLINE: Analytical and numerical models of nearshore zones will be used to simulate observations on the North shore of Lake Ontario available from past field programs. Results from the 1982/83 Lake Ontario Field program will be used for model verification as soon as they become available. A special model will be developed to simulate the near-field behaviour of the Niagara River plume and its far-field interactions with the Western basin of Lake Ontario. Results will be published in a report by March 1983.

STUDY TITLE	Simulation of Toxic Contaminants Fate in Lake Ontario	DIV OR ORG APSD
KEY WORDS	TOXIC SUBSTANCES, NIAGARA RIVER, LAKE ONTARIO, SEDIMENTS, MODELS	SEC'N OR GRP BIMS
STUDY LEADER	Halfon, E. TEL: 637-4243	PAE 4200
TEAM MEMBERS	J. Maguire and R. Platford	DATE 82/01/22
ECS PROGRAM	M.R.C. - Toxic Substances	
ACTIV ELEM	Toxic Substances	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

GOALS: To understand pathways and fate of organic contaminants in the Niagara River/Lake Ontario area by simulation modelling. To reduce scientific uncertainties and to obtain a predictive capability based on physical/chemical properties of the contaminants. To set up a data base of physical/chemical properties and reaction rates useful for modeling and for use by scientists in the Environmental Contaminants Division. To analyze sediments data with diagenetic models to quantify the water sediment interactions of various chemicals. To analyze sediments trap data collected by M. Charlton for the same purpose. To assist in the development of a data base of concentrations of organic contaminants in the Great Lakes. This data base is being organized within the Data Management Section.

RELEVANCE: Sorption of contaminants by particulate matter (mineral or organic, suspended or bottom sediments) is a major factor controlling their pathways in the aquatic ecosystem. Laboratory and field studies are taking place at NWRI to obtain basic data (1981/82 studies ECD-3220, 3222, 3224, 3225). Incorporation of these data in a modeling framework will help in obtaining a prediction capability. A data base provides a basic framework for collection and storage in a form suitable for modeling. This study will be part of a large multidisciplinary interdivisional research study in the Niagara River/Western Lake Ontario region.

WORK OUTLINE: A data base for physical/chemical properties of organic contaminants will be developed within the EXAMS framework. Field scientists will therefore be able to run in real time simulation models to assess the relevance of their data within an ecosystem approach. The data base will be confidential until results can be shared with the scientific community at large. Thus a modelling activity can take place before data are published. A simulation model for the Niagara River/Western Lake Ontario region will be developed in conjunction and in support of the data base. Diagenetic models will be run to assess the behaviour of contaminants in the sediments after deposition and possibly to compute rates of deposition. This exercise should also provide rates of exchange between water and sediments when simulation results will be coupled with the analysis of the sediment trap experiments. A technical data report on the usage of toxic contaminants data base and a scientific paper on diagenetic and bioturbation models will be produced by March 1983.

STUDY TITLE	Statistical Analysis of Surveillance Data	DIV OR ORG APSD
KEY WORDS	NIAGARA RIVER, LAKE ONTARIO, STATISTICAL MODELLING, SURVEILLANCE	SEC'N OR GRP BIMS
STUDY LEADER	El-Shaarawi, A. TEL: 637-4584	PAE 1103
TEAM MEMBERS		DATE 82/01/20
ECS PROGRAM	Canada/U.S. and Interprovincial Waters	
ACTIV ELEM	Surveillance/Monitoring	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

- GOALS:**
1. To develop time series models for TP concentration from Niagara and St. Lawrence Rivers.
 2. To develop time series models for TP input (loading) from Niagara River into Lake Ontario and TP output from Lake Ontario via St. Lawrence.
 3. To develop a transfer function model between TP input from Niagara River into Lake Ontario and TP output from Lake Ontario via St. Lawrence river.
- RELEVANCE:** This study will allow the determination of trend in TP concentration from Niagara and St. Lawrence Rivers over the period 1975 to 1981. The developed models will allow the optimization of future data collection. The transfer function model will allow us to determine the response of TP in St. Lawrence to changes in TP in Niagara River.
- WORK OUTLINE:**
1. Development of Mathematical Models.
 2. Fitting these models to collected data and checking their suitability.
 3. Testing the trend component for significance.
 4. Utilization of the models to determine the sampling strategy.
 5. Preparation and completion of a report summarizing the results by March 1983.

STUDY TITLE	Coastal Exchange/Transport Models	DIV OR ORG APSD
KEY WORDS	GREAT LAKES, SURVEILLANCE, MIXING ZONES, NEARSHORE, MODELS	SEC'N OR GRP BIMS
STUDY LEADER	Murthy, C.R. TEL: 637-4235	PAE 1716
TEAM MEMBERS		DATE 82/02/02
ECS PROGRAM	Water Management Research	
ACTIV ELEM	Aquatic Physics and Systems	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

- GOALS: To develop coastal transport models for specific discharge sources around the perimeter of the Great Lakes.
- RELEVANCE: Study undertaken in response to IJC/GLWQA decisions.
- WORK OUTLINE:
1. To develop appropriate coastal flow and dispersion climatologies for coastal transport models to predict dilution of contaminants around discharge sources.
 2. To apply coastal transport models to specific discharge sources around the perimeter of the Great Lakes.
 3. To undertake any specific tasks related to coastal problems assigned by IJC bodies and to interact with MOE scientists involved in coastal work.
 4. Preparation and completion of report by March 1983.

STUDY TITLE	Aquatic Regime Acidification Models	DIV OR ORG APSD
KEY WORDS	ACID RAIN, ENVIRONMENTAL SIMULATION, LRTAP	SEC'N OR GRP BIMS
STUDY LEADER	Lam, D.C.L. TEL: 637-4235	PAE 4300
TEAM MEMBERS	A.G. Bobba, D. Jeffries and F.C. Elder	DATE 82/01/29
ECS PROGRAM	M.R.C.-LRTAP	
ACTIV ELEM	Long Range Transport of Airborne Pollutants - Aquatic	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE**GOALS:**

1. To develop a modelling capability to simulate the hydro-geological responses of the Canadian regime to the external loading due to LRTAP by review, improvement, extension and implementation of deterministic models of lake and watershed acidification.
2. To assess the environment response of the Canadian aquatic regimes to LRTAP stress by applying modelling approaches in loading control strategies and scenarios.

RELEVANCE:

The primary requirement of the Canada-U.S. Memorandum of Intent concerning Transboundary Air Pollution is the specification of ecosystem tolerance and response to LRTAP stresses. The modelling efforts are necessary to synthesize the information into comprehension regime response simulation.

WORK OUTLINE:

- a) To evaluate available hydro-geochemical acidification and water quality models and to develop the most appropriate model to include the pH effects on nutrients and primary production of planktons and to modify existing groundwater transport model to accommodate the pathways of major ions affecting the alkalinity and acidity of the aquatic ecosystem (by March 1983);
- b) To integrate watershed data to pinpoint the pathways leading to surface or groundwater systems and to calibrate known chemical equilibrium equations for the carbon, sulphur and nitrogen cycles for these systems (by March 1984);
- c) To continue to upgrade the model components, to feedback to scientific experimental projects and to react to LRTAP program requirements following completion of each stage of model development.

STUDY TITLE	Vertically Profiling Current Meter and Temperature Sensor (GVAPS)	DIV OR ORG APSD
KEY WORDS	PHYSICAL LIMNOLOGY, INSTRUMENTATION, GREAT LAKES, MIXING	SEC'N OR GRP BIMS
STUDY LEADER	Boyce, F.M. TEL: 637-4277	PAE 1716
TEAM MEMBERS	F. Roy, E. Harrison (ESS), P. Hamblin, J. Bull	DATE 82/01/29
ECS PROGRAM	Water Management Research	
ACTIV ELEM	Aquatic Physics and Systems	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

- GOALS: To continue the development of a vertically profiling instrument vehicle suitable for unattended operation in deep water (GVAPS).
- RELEVANCE: Detailed knowledge of the vertical structure of horizontal currents is needed in order to establish accurate budgets of heat, mass, momentum and dissolved species in experimental control volumes. Knowledge will improve accuracy of estimates of turbulent fluxes. GVAPS system is of particular interest because it can carry a wide range of sensors (current meter, temperature sensor, conductivity, dissolved oxygen, etc.).
- WORK OUTLINE: Consult with Engineers/Tech Ops on redesign of cable and other elements, location and plan for field test in Lake Ontario in midsummer, 1982.
- Participate in field test of system on the North Shore of Lake Ontario in August 1982.
- Evaluate results of field test.
- Process data into final scientific form.
- Report on GVAPS system (March 1983)

STUDY TITLE	Water Movements in the Central Basin of Lake Erie, Phase III	DIV OR ORG APSD
KEY WORDS	PHYSICAL LIMNOLOGY, LAKE ERIE, OXYGEN DYNAMICS	SEC'N OR GRP BIMS
STUDY LEADER	Boyce, F.M. TEL: 637-4277	PAE 1716
TEAM MEMBERS	P. Hamblin, C.R. Murthy, D. Lam, M. Charlton, D. Robertson, F. Chiocchio, K. Miners, M. Kerman, G. Ivey (pdf), J. Patterson (vf), and C.H. Mortimer (contract).	DATE 82/01/29
ECS PROGRAM	Water Management Research	
ACTIV ELEM	Aquatic Physics and Systems	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE**GOALS:**

To follow up experimental work undertaken in 1979 and 1980 with analysis and reporting of selected portions of the data, to coordinate analyses with participating U.S. researchers (GLERL), to synthesize major results of the experiments into a comprehensive report.

RELEVANCE:

Biochemical processes (such as oxygen depletion) in Lake Erie are strongly influenced by physical processes such as entrainment, mixing, resuspension of sediments, upwelling/downwelling. Documentation/quantification of these processes as they affect water quality is essential to sound management policy based on a knowledge of the natural, physically induced, variability of the system. Knowledge derived from these studies will assist in NWRI systems modelling program.

WORK OUTLINE:

1. Analysis and Reporting - Tentative report titles:
Vertical and horizontal distribution of D.O. and chemical species in the vicinity of the 1980 mid-basin experiment site (internal report).
Vertical structure of horizontal currents in mid-basin (report and journal publication).
Heat budget of the mid-basin region for the 1980 experiment (internal report).
Mixing in the Cleveland coastal boundary layer (McMaster contract)
Exchange flow in the Central Basin due to horizontal density differences (report and journal publication).
2. Synthesis of physical and biochemical results.
A volume, similar to the Project Hypo report, is the goal. The volume will contain selected research papers based on the 1979 and 1980 experiments plus one or more review papers. C.H. Mortimer (on contract) will act as senior editor. He will chair a series of workshops and planning meetings at NWRI starting in the autumn of 1982 to coordinate the reporting and to encourage contributions. He will himself contribute to the summarizing of reviews.

STUDY TITLE	Lake Ontario Physical Limnology Studies	DIV OR ORG APSD
KEY WORDS	LAKE ONTARIO, NIAGARA RIVER, PHYSICAL LIMNOLOGY, COASTAL ZONE	SEC'N OR GRP BIMS
STUDY LEADER	Murthy, C.R. TEL: 637-4235	PAE 1716
TEAM MEMBERS	J.A. Bull, K.C. Miners, F. Chiocchio, D.G. Robertson and M. Kerman	DATE 82/02/02
ECS PROGRAM	Water Management Research	
ACTIV ELEM	Aquatic Physics and Systems	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

GOALS: To determine to what extent the local physical processes of the nearshore zone are affected by lake-wide processes and large scale forcing. Specifically, (1) to relate nearshore current reversals to alongshore propagation of topographic and baroclinic wave phenomena; (2) to analyze cross-shore variations of currents in terms unusual modes of oscillations and effects of trithion and diffusion in shallow water; (3) to determine the relative effects of small scale mixing and large scale upwelling on the nearshore thermal regime; (4) to study the impact of mass exchanges between the nearshore zone and open lake on seasonal variations of water quality parameters in the nearshore zone and (5) to delineate the seasonal characteristics of the Niagara River plume in support of toxic contaminant and other related biochemical surveys.

RELEVANCE: Coastal zones are the areas of most immediate interest and concern and thus the need for research on physical processes and water quality properties of these zones. Such information is vital to the solution of practical problems such as environmental impact of energy development in the northshore of Lake Ontario and of the influence of Niagara River on the Lake Ontario western basin.

WORK OUTLINE:

1. To establish 28 current meter moorings employing 60 current meters, 8 FTP moorings, 8 meteorological stations, 3 tide guages and 3 wave rider moorings to collect time-series data on current speed/direction, water temperature, water level fluctuations and wind speed/direction during May 1982 to March 1983.
2. Seven EBT and drogue surveys will be undertaken near the mouth of the Niagara River during the proposed AED/ECD Toxics/bio-chemical cruises.
3. Preparation and completion of Niagara River plume study report by March 1983

STUDY TITLE	Assessment of the Present Surveillance Program and Future Strategy	DIV OR ORG APSD
KEY WORDS	LAKE ONTARIO, STATISTICAL MODELLING, SURVEILLANCE	SEC'N OR GRP BIMS
STUDY LEADER	El-Shaarawi, A. TEL: 637-4584	PAE 1103
TEAM MEMBERS	GLBL (RDG/DOE 1323)	DATE 82/02/02
ECS PROGRAM	Canada/U.S. and Interprovincial Waters	
ACTIV ELEM	Surveillance/Monitoring	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

- GOALS:** The work in this year will be restricted to Lake Ontario and is concerned with:
- 1) Determining the changes in the quality of water.
 - 2) Examining the spatial variability and isolating regions in Lake Ontario with low quality of water.
 - 3) Studying the association between different limnological variables such as TP, TKN, TN, NH₃, chlorophyll a, and dissolved oxygen.
- RELEVANCE:** This is a continuation of the work on determining trend in the Great Lakes and summarizing the information available in the present surveillance program.
- WORK OUTLINE:**
- 1) Performing trend evaluation on TP, TKN, TN, NH₃ and chlorophyll a.
 - 2) Developing model for the spatial pattern and determining the type of dependence between regions.
 - 3) Determining a sampling plan for future data collection.
 - 4) Preparing the report.
- The results of this study will be summarized in a report by March 31, 1983.

STUDY TITLE	Great Lakes Climatic Atlas (Volume 2)	DIV OR ORG APSD
KEY WORDS	GREAT LAKES, CURRENTS, TEMPERATURES, PHYSICAL LIMNOLOGY, LAKE ONTARIO	SEC'N OR GRP BIMS
STUDY LEADER	Boyce, F.M. TEL: 637-4277	PAE 1716
TEAM MEMBERS	D.G. Robertson, F. Chiocchio and M. Kerman	DATE 82/01/29
ECS PROGRAM	Water Management Research	
ACTIV ELEM	Aquatic Physics and Systems	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

- GOALS:** To prepare Volume 2 of the Great Lakes Climatic Atlas which will contain climatological/statistical summaries of Great Lakes currents and temperatures (AES/CCC will produce Volume 1 summarizing meteorological parameters). This study plan covers the first of a two-year effort.
- RELEVANCE:** There is a growing number of requests for information on winds, waves, and currents in the Great Lakes from sailors, yachtsmen, fishermen and occasionally from police officers searching for missing persons or boats. Many of these requests could be filled with a document which gave a climatological/statistical summary of conditions in the Lakes. The combined CCC/NWRI data base provides ample information for such a summary.
- WORK OUTLINE:** 1982. Develop tables of contents, formats jointly with counterparts at CCC. Develop software for computer-generated graphics. Assemble data base.
1983. Produce maps, charts and tables. Write supporting text. Publish Volume 2 of Atlas.

STUDY TITLE	Water Quality Simulation on Ice Covered Lakes	DIV OR ORG APSD
KEY WORDS	PHYSICAL LIMNOLOGY, PLUMES, WATER QUALITY, MODELS	SEC'N OR GRP BIMS
STUDY LEADER	Hamblin, P.F. TEL: 637-4277	PAE 1716
TEAM MEMBERS	J. Patterson (Visiting Professor)	DATE 82/02/01
ECS PROGRAM	Water Management Research	
ACTIV ELEM	Aquatic Physics and Systems	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

- GOALS: The objective of this study is to gain understanding of the processes controlling the inflow and outflow of rivers entering and draining deep stratified lakes. Of particular concern is the influence of ice cover. A water quality model will be extended to include the effect of ice cover on long term water quality simulation.
- RELEVANCE: Establishing the ecological sensitivity of northern lakes and reservoirs to resource development is identified as a national priority. See for example ECS Strategic Plan (1982/87) "begin research into the impacts of major water diversions and the impacts of hydro-electric development in northern areas." Knowledge gained may be applied to other lake-river systems such as the inflow of the Niagara River into Lake Ontario.
- WORK OUTLINE:
- 1) Review literature on theoretical, laboratory and field studies of lake-river interactions and ice modelling.
 - 2) Purchase and field deployment of a hand-held current meter during the winter ice covered period in Lake Laberge, Yukon Territory.
 - 3) Formulation and testing of model hypothesis on data collected during field study.
- Note: The field activities are to be coordinated with a proposed study of the Yukon River Basin by E. Carmack and C. Pharo of NWRI, Pacific and Yukon Region.

STUDY TITLE	Spectro-Optical Modelling and Applications to Water Research	DIV OR ORG APSD
KEY WORDS	OPTICS, LAKE, MODELS, GREAT LAKES, SATELLITES	SEC'N OR GRP ESO
STUDY LEADER	Bukata, R.P. TEL: 637-4670	PAE 1716
TEAM MEMBERS	J.H. Jerome, J.E. Bruton	DATE 82/02/03
ECS PROGRAM	Water Management Research	
ACTIV ELEM	Aquatic Physics and Systems	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

- GOALS:**
- 1) To develop in situ spectro-optical models based upon the principles of radiative transfer theory, which may be applied both to the determination of lake water quality parameters and the availability of subsurface light for biophysical processes.
 - 2) To evaluate a recently developed upwelling/downwelling radiometer system in terms of remote determinations of chlorophyll a and suspended mineral concentrations from a moving surveillance ship.
 - 3) To continue evaluating the applications of satellite acquired data to lakes research.
 - 4) To establish a fixed profiling radiometer system in Lake Ontario for time-series studies of light availability.
 - 5) To continue the development of methodology appropriate to the ESOS computerized display system.
 - 6) To initiate a time-series study, utilizing LANDSAT data of the location and dynamical features of the Niagara plume.
- RELEVANCE:** The importance of the interaction of light with water bodies in such fields as biology and the life sciences is obvious. The nature and goals of the NWRI spectro-optical Great Lakes program (both in situ and space oriented) are in direct accord with the priorities outlined in the Water Quality Agreement. The development of spectro-optical capabilities has resulted directly in contributions to lake water classification in terms of organic and inorganic constituents, and as such plays a potentially strong role in lake monitoring and surveillance. The development of optical models based upon radiative transfer theory greatly assists the evaluation of spectro-optical data collected remotely from satellite and airborne sensors.
- WORK OUTLINE:** The goals are part of the on-going objectives of the spectro-optical program initiated last year. The spectro-optical research during this coming year will be roughly equally divided between theoretical model development, verification and refinement and field studies. The field work will centre around the design, fabrication and operation of an upwelling irradiance downwelling radiance system to be mounted on surveillance vessels.

STUDY TITLE	Pollutant Transport through Porous Media	DIV OR ORG APSD
KEY WORDS	ENVIRONMENTAL SIMULATION, GROUND WATER, RADIOACTIVITY	SEC'N OR GRP ESO
STUDY LEADER	Bobba, A.F. TEL: 637-4200	PAE 1716
TEAM MEMBERS	R.P. Bukata	DATE 82/02/03
ECS PROGRAM	Water Management Research	
ACTIV ELEM	Aquatic Physics and Systems	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

GOALS:

- 1) To develop realistic hydrogeological models of contaminant transport through subsurface systems with special emphasis upon the discharge of groundwater to inland lakes.
- 2) To establish a numerical simulation describing the interaction between surface and subsurface water systems.
- 3) To apply the contaminant transport model to the Port Granby radioactive waste disposal test-site.

RELEVANCE:

The presence of contaminant (physical, chemical, radioactive) concentrations in the saturated zone greatly impacts the groundwater flow system and may ultimately present hazards in lake water usage and the regional water supply. The importance of such work is well defined within the contexts of the Canada/U.S. Water Quality Agreement and the Environmental Contaminants Act.

WORK OUTLINE:

This project is essentially a continuation of the 1981/82 program. It is largely concerned with model development and the application of these models to specific test-sites. As such it is largely theoretically oriented. While field work is required, it will not be performed to any large degree by ESOS, but rather by involvement with the Environmental Contaminants Division through Ray Durham and his colleagues.

A report describing the model development model validation using Port Granby data will be produced by March 1983.

STUDY TITLE	Water Quality Data Base Administration	DIV OR ORG APSD
KEY WORDS	DATA MANAGEMENT, DATA QUALITY	SEC'N OR GRP DATA M
STUDY LEADER	Duffield, R. TEL: 637-4324	PAE 1103
TEAM MEMBERS	J. Rogalsky, W. Nagel and A. Zingaro	DATE 82/01/20
ECS PROGRAM	Canada/U.S. and Interprovincial Waters	
ACTIV ELEM	Surveillance/Monitoring	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

- GOALS:** To provide for the secure administration, integration and operational accessibility to current and historical scientific data acquired in support of the Great Lakes Surveillance program. To facilitate data analysis and interpretation in anticipation of research and reporting requirements. To acquire and manage new data bases needed in support of federally mandated programs.
- RELEVANCE:** To formulate new or revised data base structures for relational data sets providing for scientific compatability, both operational and back-up data security, convenient and economic access, enhanced analytical and display capabilities, ensuring minimum expenditure of resources, to fulfil the desired aims of established programs and to identify and enunciate the implications of various alternatives available to CCIW management.
- WORK OUTLINE:**
1. Maintain DBMS and existing programs, or enhance other file management software systems using new EDP technologies.
 2. Apply the System 2K Data Base Management System for various existing or new data storage/retrieval requirements related to the surveillance program and lakes evaluation research (i.e.) toxic substances.
 3. Undertake periodic reviews of data collection, data reduction and archival back-up programs to meet departmental objectives and security regulations on an economic and timely basis.
 4. Prepare appropriate documented operational or policy proposals and recommendations for management consideration.
 5. Prepare documents related to water quality data bases and systems for publication.
 6. Participate in special studies aimed at the rationalization of data management practices in relation to departmental plans and initiatives for the establishment of cooperative standardized or compatible data processing services.
 7. Participate in meetings or assumed delegated responsibility on internal, or departmental, committees and work groups engaged in the development of plans and policy recommendations in relation to the management of environmental data.

STUDY TITLE	NWRI Branch Research Support - Data Management	DIV OR ORG APSD
KEY WORDS	EDP DESIGN, EDP PROGRAMMING, EDP CONSULTATION, EDP TRAINING	SEC'N OR GRP DATA M
STUDY LEADER	Comba, H. TEL: 637-4628	PAE 1700
TEAM MEMBERS	Head, Data Management and Staff	DATE 82/01/20
ECS PROGRAM	Water Management Research	
ACTIV ELEM	General	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

- GOALS:** To provide professional consultaton, scientific manuscript production and systems design services, and computer programming and data processing support required for NWRI Branch research studies and environmental monitoring activities as determined and scheduled from projected support requirements identified in approved study forecasts.
- RELEVANCE:** Provision of professional and direct support for computer based systems development or modification and for scientific manuscript production, data reduction and statistical analysis work is essential to complete NWRI studies approved in the context of departmental programs.
- WORK OUTLINE:** To meet the goals it is necessary to:
1. Review and evaluate, schedule, monitor and revise professional programming, clerical and technical resources requested in the research study forecasts for fiscal year 1982/83, and provide scientific manuscript production services.
 2. Consult with NWRI scientists regarding study support requirements, data applicability, and valid mathematical procedures.
 3. Analyse detailed data processing requirements, synthesize and/or review software systems and develop related computer programs in support of approved research studies.
 4. Provide professional consulting services to resolve short term unscheduled programming problems encountered by users of computer facilities in relation to hardware/software development.
 5. Provide developmental support to approved internal activities in support of general EDP requirements for NWRI.
 6. Evaluate EDP needs and procedures and identify desirable equipment upgrades, conversions, or procedural revisions.
 7. Develop special administrative applications at management direction through approved reassignment of resources.
 8. Implement training programs for staff development and users through approved external or contracted in-house courses, and custom materials developed internally in relation to: on-line program design, S2K EDP/SOFTWARE FILES/SYSTEMS SECURITY and PROJECT MANAGEMENT.

NATIONAL WATER RESEARCH INSTITUTE

Study Plan

NO: 82-574

STUDY TITLE	Non-NWRI Branch Research Programming Support	DIV OR ORG APSD
KEY WORDS	EDP DESIGN, EDP PROGRAMMING, EDP CONSULTATION, EDP TRAINING	SEC'N OR GRP DATA M
STUDY LEADER	Comba, H. TEL: 637-4628	PAE 1103
TEAM MEMBERS	Head, Data Management and Staff	DATE 82/01/20
ECS PROGRAM	Canada/U.S. Interprovincial Waters	
ACTIV ELEM	Surveillance/Monitoring	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

- GOALS:** To provide professional consultation, systems design services, and computer programming and data processing support required for Non-NWRI Branch research studies and environmental monitoring activities required for approved programs, as identified and scheduled from approved study forecasts.
- RELEVANCE:** Provision of professional guidance and direct support for computer based systems development or modification and for special scientific data reduction and statistical analysis tasks is required in support of approved programs.
- WORK OUTLINE:**
1. Review and evaluate, schedule, monitor and revise professional programming, clerical and technical resources requested in study forecasts for fiscal year 1982/83.
 2. Consult with scientists regarding study support requirements, data applicability, and valid mathematical procedures.
 3. Analyse detailed data processing requirements, synthesize and/or review software systems and develop related computer programs in support of approved studies.
 4. Provide professional consulting services to resolve short term unscheduled programming problems encountered by users of computer facilities in relation to new hardware/software development.

STUDY TITLE	GEMS/UNEP - Global Water Quality Data Management	DIV OR ORG APSD
KEY WORDS	GLOBAL, WATER QUALITY, DATA MANAGEMENT	SEC'N OR GRP DATA M
STUDY LEADER	Rogalsky, J. TEL: 637-4292	PAE 1916
TEAM MEMBERS	R. Duffield, W. Nagel and J. Byron	DATE 82/01/20
ECS PROGRAM	Management and Administration	
ACTIV ELEM	WHO	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

- GOALS:** To maintain, operate and enhance, an expanding globally centralized computer based storage and retrieval system for surface and ground-water quality data, providing for file security, controlled access, and for standard and selective data retrieval and information processing services on demand.
- RELEVANCE:** NWRI has accepted responsibility to develop, implement and operate data base management facilities for the Global Water Quality monitoring project sponsored by UNEP/WHO/UNESCO/WMO, and provide relevant expertise on request.
- WORK OUTLINE:**
1. Maintain systematic procedures to handle semi-annual submissions of global water quality monitoring data from six international regions covering earth.
 2. To convert data to locally processible media from forms, listings, cards or magnetic tapes.
 3. To create data files and update relevant data base management files covering station history, parameter dictionary and global water quality data.
 4. Revise and update software systems and parameter code dictionary as required.
 5. To develop supplementary software as required for the retrieval, summarization and display of the data.
 6. To prepare and provide training as required at Regional Centres in other countries.
 7. To respond to scientific and operational enquiries from 152 countries.
- OPERATIONAL TASKS:** 1) Review and update all operational plans for 152 countries; 2) monitor data receipts against the operational plan; 3) convert all data sets to standardized input formats/media; 4) maintain updated data base files and backup files; 5) quality control and correct data files; 6) archive source data sets; 7) maintain international liaison, coordinate changes and communicate on a global basis as required; 8) prepare standard approved computer outputs and distribute globally; 9) develop software on request from WHO; 10) provide data retrieval services in response to global requests, and 11) develop and provide training courses at Regional Centres and meet with foreign visitors.

STUDY TITLE	Aquatic Regime Acidificaton Models and Monitoring	DIV OR ORG APSD
KEY WORDS	ACID RAIN, ENVIRONMENTS, AQUATIC	SEC'N OR GRP APSDIV
STUDY LEADER	Thompson, M.E. TEL: 637-4513	PAE 4300
TEAM MEMBERS	M.B. Hutton	DATE 82/02/03
ECS PROGRAM	M.R.C.- LRTAP	
ACTIV ELEM	Long Range Transport of Airborne Pollutants - Aquatic	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

GOALS:

1. In cooperation with WQB, IWD, and Provincial Agencies, incorporate a surface water monitoring program capable of defining the changes in chemical properties related to the LRTAP stress on the surface waters of eastern Canada.
2. To analyze and interpret the data collected under the monitor program, use the data to test and validate the CDR model in its present state, and as it may be modified (see Lam et al 82-507) and relate the data to the atmospheric deposition due to LRTAP.

RELEVANCE:

The primary requirement of the Canada-U.S. Memorandum of intent concerning Transboundary Air Pollution is the specification of eco-systems tolerance and response to LRTAP stresses. Both a monitoring and a modelling program are necessary to 1) demonstrate adverse effects, and 2) model and quantify the necessary remedial measures.

WORK OUTLINE:

- a) By July 1982, evaluate, assess and recommend modification of the Atlantic Region monitor program.
- b) If possible, during 1982/83 in cooperation with Quebec Region IWD develop and implement a monitor program in Quebec.
- c) In cooperation with Ontario MOE and MNR assess ongoing monitor programs in Ontario.
- d) By March 1983, produce a comprehensive report on the LRTAP monitor program.
- e) To evaluate available hydro-geochemical regime response models, select and develop the most appropriate models, and to program this model by March 1983.

STUDY TITLE	Coordination of IWD LRTAP Program	DIV OR ORG APSD
KEY WORDS	ACID PRECIPITATION, LRTAP, COORDINATION	SEC'N OR GRP APSDIV
STUDY LEADER	Elder, F.C. TEL: 637-4288	PAE 4300
TEAM MEMBERS	IWD Managers in LRTAP Program, NWRI, NHRI, WQB, WRB	DATE 82/02/16
ECS PROGRAM	M.R.C.- LRTAP	
ACTIV ELEM	Long Range Transport of Airborne Pollutants - Aquatic	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

GOALS:

- a) To coordinate the development of the IWD LRTAP program under the framework of the DOE and ECS LRTAP program plans.
- b) To monitor the progress and status of the IWD LRTAP Program.
- c) To represent IWD on the ECS LRTAP Committee and to provide IWD information to the DOE and Federal/Provincial LRTAP committees and work groups.
- d) To provide information flow from the IWD LRTAP program to the MOI or other International Negotiating bodies.

RELEVANCE: The LRTAP and its effects on the aquatic regimes of Canada has been identified as a priority concern in the ECS program. The IWD provides the primary water chemistry research and monitor functions to the ECS program. It is essential that the program be coordinated and that research and monitor results are directed toward the problem solution.

WORK OUTLINE: In cooperation with IDW Managers, develop the IWD LRTAP program plan. April 1972.
Monitor progress and status of resource utilization in the IWD LRTAP Program. 6 month and 9 month reports.
Coordinate the flow of IWD LRTAP Information by symposia, workshops and reports. As appropriate.

STUDY TITLE	APSD - Capital Procurement	DIV OR ORG APSD
KEY WORDS	PHYSICAL LIMNOLOGY, GREAT LAKES	SEC'N OR GRP BIMS
STUDY LEADER	Bull, J. TEL: 637-4218	PAE 1716
TEAM MEMBERS	APSD Staff	DATE 82/02/04
ECS PROGRAM	Water Management Research	
ACTIV ELEM	Aquatic Physics and Systems	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

GOALS: To acquire the specialized instrumentation systems required to reliably measure and record those physical processes which are beyond the capability of our existing instruments.

RELEVANCE: In recent years considerable emphasis has been placed on physical processes and their impact on water quality in the coastal zones of the Great Lakes. These processes are more complicated, less regular, and more difficult to describe in terms of mathematical models than large scale phenomena in the open lakes. The difficulties are not in the lack of conceptual models but in the difficulty of identifying the relative contribution of individual processes towards the observed structure. These questions can only be addressed by a series of combined experimental and modelling programs to try and match detailed coastal measurements with various available models.

Specialized instrumentation systems must be assembled and utilized. Emphasis for FY 82/83 is towards bottom boundary layer current measurements and towards differential pressure measurements over distance scales of 0.5 to 1 km.

WORK OUTLINE The following specialized measurement systems will be developed:

- 1) A system to directly measure the small surface gradients over distances on the order of 1 km.
- 2) A profiling system to determine the effects of the incident light distribution and the optional properties of the water column.
- 3) A bottom boundary layer system capable of giving current profiles and optical properties over the bottom metre to enable the calculation of shear stress, etc.
- 4) Two bottom mounted nearshore fixed current and temperature station with burst sampling mode capability.

ANALYTICAL METHODS DIVISION

SECTION STUDY STUDY TITLE

STUDY LEADER

**

ANALYTICAL CHEMISTRY RESEARCH

601 GC/MS-CHEMICAL IONIZATION METHODOLOGY FOR ENVIRONMENTAL ANALYSIS
 602 QUANTITATIVE DETERMINATION OF PCB'S IN SEDIMENTS
 603 DETERMINATION OF METALS IN ENVIRONMENTAL SAMPLES BY ICAP
 604 DETERMINATION OF NON-METALS IN VACUUM ULTRAVIOLET RANGE OF ICAP
 605 DETERMINATION OF CHROMIUM IN WATER BY ATOMIC ADSORPTION SPECTROSCOPY
 606 ELECTROANALYTICAL TECHNIQUES IN WATER ANALYSIS
 607 ALTERNATING STANDARD-SAMPLE TECHNIQUE IN WATER ANALYSIS
 608 CONCENTRATION, ANALYSIS AND IDENTIFICATION OF TRACE ORGANICS
 609 METHOD FOR PHTHALATE ESTERS BY HIGH PRESSURE LIQUID CHROMATOGRAPHY
 610 CONSULTATION, TECHNOLOGY TRANSFER, SPECIAL SERVICES, INSTRUMENT MAINT.
 615 METHODS DEVELOPMENT AND CONFIRMATION OF CONTAMINANTS IN THE GLB
 616 RADIOIMMUNOASSAY TECHNIQUES FOR DIOXINS
 619 DIOXINS AND BENZOFURANS METHODOLOGY

ONUSKA, F. I.
 ONUSKA, F. I.
 GOULDEN, P. D.
 GOULDEN, P. D.
 GOULDEN, P. D.
 SEKERKA, I.
 SEKERKA, I.
 AFGHAN, B. K.
 AFGHAN, B. K.
 AFGHAN, B. K.
 ONUSKA, F. I.
 AFGHAN, B. K.
 AFGHAN, B. K.

DIVISION

600 ANALYTICAL METHODS DIVISION ADMINISTRATION
 681 CAPITAL EQUIPMENT ACQUISITION (ACRS)
 682 CAPITAL EQUIPMENT ACQUISITION (GAMS)

LAWRENCE, J.
 LAWRENCE, J.
 LAWRENCE, J.

COMPUTER SERVICES

670 COMPUTER SERVICES FOR WATER MANAGEMENT RESEARCH

PULLEY, H. C.

MICROBIOLOGY LABORATORIES

621 MEDIA, WASH-UP, INSTRUMENT AND GENERAL SUPPORT
 622 LEGIONELLA
 624 EFFECT OF ACID PRECIPITATION ON FUNGI IN FRESH WATER
 625 MICROBIAL NITROGEN CYCLE METHODOLOGY
 626 BACTERIAL TOXICITY WORKSHOP
 628 BACTERIAL WATER QUALITY SURVEILLANCE LOWER LAKES
 683 ACID RAIN EFFECTS ON MICROBIAL RESPONSE IN AQUATIC ECOSYSTEMS

MCINNIS, R.
 DUTKA, B. J.
 SHERRY, J.
 DUTKA, B. J.
 DUTKA, B. J.
 RAO, S. S.
 RAO, S. S.

QUALITY ASSURANCE METHODS

641 QUALITY ASSURANCE AND METHODS SECTION - ADMINISTRATION / MEASUREMENT
 642 FICP QUALITY CONTROL STUDIES
 643 INTERREGIONAL QUALITY CONTROL PROGRAM
 644 DEVELOPMENT OF STANDARD REFERENCE MATERIALS
 645 METHOD ADAPTATION FOR WQB LABORATORIES
 646 METHODS DEVELOPMENT FOR HERBICIDES
 653 IJC QUALITY ASSURANCE STUDY
 654 PRAIRIE PROVINCES WATER BOARD QUALITY ASSURANCE PROGRAM
 657 INTERLABORATORY QUALITY ASSURANCE PROGRAM
 659 LRTAP QUALITY ASSURANCE PROGRAM(PHASE 1)

CHAU, A. S. Y.
 CHAU, A. S. Y.
 CHEMIST
 CHEAM, V.
 CHEAM, V.
 CHEMIST
 ASPILA, K. I. (INORG
 .S. Y. (ORGANIC)
 CHEMIST
 LEE, H. B.
 ASPILA, K. I.
 CS) CHAU,

STUDY TITLE	Analytical Methods Division Administration	DIV OR ORG AMD
KEY WORDS	ADMINISTRATION, METHODS DEVELOPMENT, QUALITY CONTROL	SEC'N OR GRP AMDDIV
STUDY LEADER	Lawrence, J. TEL: 637-4319	PAE 1717
TEAM MEMBERS		DATE 82/01/19
ECS PROGRAM	Water Management Research	
ACTIV ELEM	Analytical Methods	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

GOALS: To ensure effective administration of the Analytical Methods Division and to provide leadership to the scientific program.

RELEVANCE: The Analytical Methods Division responds to the needs of scientists in other NWRI research divisions, WQB, EPS, GLBL and ECS.

WORK OUTLINE: To plan, implement and administer the activities of the Analytical Methods Division.

STUDY TITLE	GC/MS-Chemical Ionization Methodology for Environmental Analysis	DIV OR ORG AMD
KEY WORDS	METHODS DEVELOPMENT, ANALYSIS, INSTRUMENTATION, CHLORINATED PHENOLS, POLLUTANTS, TRAINING	SEC'N OR GRP ACRS
STUDY LEADER	Onuska, F.I. TEL: 637-4635	PAE 4200
TEAM MEMBERS	K. Terry and Chemist	DATE 82/01/19
ECS PROGRAM	M.R.C.-Toxic Substances	
ACTIV ELEM	Toxic Substances	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

GOALS: To explore the area of various ionization modes of operation such as positive ion chemical ionization and eventually negative ion CI techniques and apply them to groups of priority pollutants in tandem with HRGC at trace levels.

RELEVANCE: Exploratory feasibility study by HRGC/MS will be attempted by means of PICI and eventually by NICI at low level. This study will enable us to expand confirmation of more polar molecules and it will be relevant to the GLWQ studies and NWRI methodologies developed for these compounds. An attempt to obtain reactant ion monitoring traces would be evaluated. A number of reactant gases will be investigated.

WORK OUTLINE

1. Evaluation of the source performances with GC/MS employing various reactant gases. September 1982 (4 man-weeks).
2. Evaluation of mixed reactant gases (carrier and reactant gases). October (10 man-weeks).
3. Application of the GC/MS in PICI and NICI for selected groups of chlorinated phenols and chlorinated diphenyl ethers. November to December (7 man-weeks).
4. Reporting-manuscript for publication (2 man-weeks).

STUDY TITLE	Quantitative Determination of PCB's in Sediments	DIV OR ORG AMD
KEY WORDS	METHODS DEVELOPMENT, PCB's, QUALITY CONTROL, SEDIMENTS	SEC'N OR GRP ACRS
STUDY LEADER	Onuska, F.I. TEL: 637-4635	PAE 4200
TEAM MEMBERS	Kominar	DATE 82/01/19
ECS PROGRAM	M.R.C.-Toxic Substances	
ACTIV ELEM	Toxic Substances	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

- GOALS: To develop reliable analytical procedures for analyzing and quantifying PCB's in sediment.
- RELEVANCE: In response to the QAMS and WQB-RL's requests, a novel approach to the quantitative determination of PCB's in sediment samples will be undertaken. At present, the analysis is performed on the packed column and it is suspected that reported results are not representing true concentration levels. The WCOT column chromatography would be able to separate and quantify individual positional isomers, if required. Final results will produce group quantitation which may resemble a particular Aroclor mixture better than packed columns.
- WORK PLAN:
1. Evaluation of existing methodologies for WCOT column preparation Grob method; our method (4 man-weeks). January 1982.
 2. Preparation of WCOT columns (SP-2100; SE-52) (4 man-weeks). February 1982.
 3. PCB-methodology-testing (sediment extracts will be provided by QAMS (Mr. Chau)), including standards:
 - GC/MS identification, 2 man-weeks. March.
 - GC-ECD qualitative and quantitative work, 10 man-weeks; March, April, May.
 - perchlorination of limited # of samples (max. 10 samples), May and June.
 - completion of a manuscript(s).

STUDY TITLE	Determination of Metals in Environmental Samples by ICAP	DIV OR ORG AMD
KEY WORDS	METALS, TRACE; METALS, HEAVY, ANALYTICAL METHODS TOXIC SUBSTANCES	SEC'N OR GRP ACRS
STUDY LEADER	Goulden, P.D. TEL: 637-4658	PAE 1717
TEAM MEMBERS	D. Anthony	DATE 82/01/19
ECS PROGRAM	Water Management Research	
ACTIV ELEM	Analytical Methods	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

- GOALS:
1. To increase the number of metals that are currently determined by ICAP.
 2. To improve the detection limits and the convenience of operation of ICAP.

RELEVANCE: The technology that has been developed in previous years for the analysis of metals by ICAP is for the determination of As and Se by hydride generation and of Al, Cd, Co, Cr, Cu, Fe, Mn, Mo, Ni, Pb, V, Zn, Ba, Ca, K, Mg, Na, and Sr by aspiration into the plasma. For 'super-low' levels, e.g., $0.1 \mu\text{g L}^{-1}$ Pb, the aspiration process requires that the sample be pre-concentrated by chelation-solvent extraction. For normal environmental levels, e.g. $0.5 \mu\text{g L}^{-1}$ Pb a preconcentration by evaporation is used. This work was carried out at the request of WQB and the technology has or is being transferred to them. Work done to date on sample-addition-to-the-plasma systems shows that these can probably be improved via e.g. ultrasonic nebulization to the point where a chelation-solvent extraction process is not necessary. There is also some requirements in the Water Quality Laboratories for the determination of other trace metals, particularly tin, both in water and in biological tissues.

- WORK PLAN: It is proposed to:
1. Study ultrasonic nebulization as a function of frequency, power and transducer design (January).
 2. Expand the ICAP atomization methods to measure Ag, B, Ti and Tl (July).
 3. Develop methods for Sb, Bi, inorganic and organic tin by hydride generation (December).
 4. Each of these three areas of work will result in an internal report and/or a paper for publication by the end of FY 81/82.

STUDY TITLE	Determination of Non-metals in Vacuum Ultraviolet Range of ICAP	DIV OR ORG AMD
KEY WORDS	TOXIC SUBSTANCES, ORGANICS, ANALYTICAL METHODS	SEC'N OR GRP ACRS
STUDY LEADER	Goulden, P.D. TEL: 637-4658	PAE 4200
TEAM MEMBERS	D. Anthony	DATE 82/01/19
ECS PROGRAM	M.R.C.-Toxic Substances	
ACTIV ELEM	Toxic Substances	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

- GOALS: To establish whether ICAP emission spectroscopy in the vacuum ultraviolet is a practical element-specific detector for chromatographic separation of nitrogen, sulphur and halogen-containing organic materials.
- RELEVANCE: In previous studies, the use of ICAP as an element-specific detector for gas chromatography has been investigated. This technique is of potential importance in the determination of organic materials by WQB in that it provides a much more unambiguous determination of specific materials than currently available detectors. The conclusions from this work are that the non-resonance emissions from the elements of interest, i.e., N, S, Cl, Br, I, are not sufficiently intense for the technique to be practical. The resonance emissions for these elements are in the vacuum ultraviolet range of the spectrum, outside the "normal" 180 to 1000 nm range of ICAP equipment. Equipment to make measurements in this wavelength range has been obtained and will be set up in the last part of FY 81/82. There will be insufficient time in FY 81/82 to complete this work.
- WORK PLAN:
1. The emission of these elements and their resource frequencies will be studied and their sensitivities determined (July).
 2. If the sensitivities are sufficiently high the ICAP-emission system will be interfaced with a gas chromatography for the determination of organic materials such as pesticides (December).
 3. This work will be documented in an internal report or publication (March).

NATIONAL WATER RESEARCH INSTITUTE

Study Plan

NO: 82-605

STUDY TITLE	Determination of Chromium in Water by Atomic Absorption Spectroscopy	DIV OR ORG AMD
KEY WORDS	CHROMIUM; METALS, TRACE; ANALYTICAL METHODS	SEC'N OR GRP ACRS
STUDY LEADER	Goulden, P.D. TEL: 637-4658	PAE 1717
TEAM MEMBERS	D. Anthony	DATE 82/01/19
ECS PROGRAM	Water Management Research	
ACTIV ELEM	Analytical Methods	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

- GOALS: To develop a valid chelation-solvent extraction procedure for the determination of chromium in natural waters.
- RELEVANCE: The current method used by the WQB laboratories for determining chromium in water does not produce valid results. This has been reported by the regional laboratories and the work done in ACRS in developing methods for analysis by ICAP identified these difficulties. The determination of chromium by ICAP is a valid method but for those laboratories which do not have ICAP, a method using atomic absorption spectrophotometry is still required. This work is being undertaken directly as a result of a request from the Pacific and Yukon region, WQB.
- WORK PLAN:
1. Water samples from the Pacific and Yukon and other regions will be analyzed using the chelation-solvent extraction technology developed in ACRS for pre-treating samples containing chromium (July).
 2. The samples will also be determined using direct ICAP methodology to confirm that the chelation-solvent extraction process is a valid one. (July).
 3. The method will be written in a form suitable for inclusion in the WQB laboratory manual. A publication will also be prepared (September).

NATIONAL WATER RESEARCH INSTITUTE		Study Plan	NO: 82-606
STUDY TITLE	Electroanalytical Techniques in Water Analysis		DIV OR ORG AMD
KEY WORDS	ANALYSIS, NITROGEN, METALS, SPECIATION, INSTRUMENTATION		SEC'N OR GRP ACRS
STUDY LEADER	Sekerka, I.	TEL: 637-4658	PAE 1717
TEAM MEMBERS	J.F. Lechner		DATE 82/01/19
ECS PROGRAM	Water Management Research		
ACTIV ELEM	Analytical Methods		
GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE			
GOALS:	<ol style="list-style-type: none"> 1. To develop a method for the determination of total organic nitrogen. 2. To develop electrochemical techniques suitable for the investigation of metal-organic interaction, separation, sampling. 3. To evaluate the feasibility of "Flow Injection Analysis" for water analysis. 		
RELEVANCE:	<ol style="list-style-type: none"> 1. Requested by WQB. 2. Electroanalytical techniques are of great potential in studying the equilibria, formation and transformation of metal-organic compounds. The importance of these studies is emphasised by "Great Lake Research Advisory Board" and by "Request for Research and Development" of WQB. 3. "Flow Injection" is a new technique used in medical and chemical analysis. It has great potential for routine application in water analysis. 		
WORK PLAN:	<ol style="list-style-type: none"> 1. To develop a simple and reliable method for the determination of total organo-nitrogen in natural water samples (April 1983). <ol style="list-style-type: none"> a) Evaluation and selection of the detection system (June 1982) b) Optimization of the pyrolytic conversion (August 1982). c) Analysis of synthetic samples (October 1982). d) Statistical evaluation and comparative analysis (April 1983). e) A paper will be prepared for publication (May 1983). 2. a) Design and construction of an electrochemical sampling device (July 1982). <ol style="list-style-type: none"> b) Laboratory testing (September 1982). c) Field testing (December 1982). 3. a) Literature survey and theoretical consideration (June 1982). <ol style="list-style-type: none"> b) Design, construction and testing of the apparatus (April 1983). 		

1/01/82

Approval _____

FORM A, PART 1

NATIONAL WATER RESEARCH INSTITUTE

Study Plan

NO: 82-607

STUDY TITLE	Alternating Standard-Sample Technique in Water Analysis	DIV OR ORG AMD
KEY WORDS	ANALYSIS, OXYGEN, DISSOLVED, TEMPERATURE, CONDUCTIVITY, HALIDES	SEC'N OR GRP ACRS
STUDY LEADER	Sekerka, I. TEL: 637-4657	PAE 1717
TEAM MEMBERS	J.F. Lechner	DATE 82/01/19
ECS PROGRAM	Water Management Research	
ACTIV ELEM	Analytical Methods	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

GOALS: To expand alternating standard-sample technique to the determination of Cl, K, hardness and pH.

RELEVANCE: The expansion of existing system (D.O., temperature, conductivity) to other water quality parameters would contribute to in-situ characterization of water as required by limnological studies of Water Management Research Program.

WORK PLAN: a) To test and calibrate a prototype of the "field system" as constructed by engineering section for D.O., temperature and conductivity (October 1982).

b) Laboratory study of the pH, Cl, K and hardness sensors in the alternating sample-standard mode of operation (April 1983).

c) To design and test instrumentation and data handling assembly for multiparameter system (April 1983).

A paper describing alternating standard-sample technique will be prepared for publication (September 1982).

STUDY TITLE	Concentration, Analysis and Identification of Trace Organics	DIV OR ORG AMD
KEY WORDS	ANALYSIS, ANALYTICAL METHODS, PCB's, POLYNUCLEAR AROMATIC HYDROCARBONS (PAH)	SEC'N OR GRP ACRS
STUDY LEADER	Afghan, B.K. TEL: 637-4661	PAE 4200
TEAM MEMBERS	J.F. Ryan	DATE 82/01/19
ECS PROGRAM	M.R.C.-Toxic Substances	
ACTIV ELEM	Toxic Substances	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

- GOALS:
- 1) To develop Automated Multiwavelength Identification Scanner (AMIS) including automated data handling capability.
 - 2) To study the feasibility of extraction of organochlorine pesticides (OC's) and polynuclear aromatic hydrocarbons (PNA's) with immisible fluids for field operation.
 - 3) To complete the work on methodologies for chlorophyll and vanadium porphyrins.

- RELEVANCE:
- 1) The AMIS scanner will be used to provide cost effective technique for confirmation and analysis of trace organics in environmental samples.
 - 2) WQB and LRTAP require field sampler to concentrate OC's and PNA's. The feasibility of new immisible fluids will be investigated to concentrate the above contaminants (See attached correspondence from Dr. B.K. Afghan of July 24, 1981).
 - 3) WQB regional laboratories require an improved methods for chlorophyll and vanadium porphyrin. Work on these methodologies was initiated during FY's 79/80, 80/81. Work will be completed during FY 82/83.

- WORK OUTLINE:
- 1) To update AMI Scanner so that automated data logging and processing can be carried out (October to November 1982).
 - 2) Analytical potential of new fluids (such as corn oil, lipids and high molecular amines) for extraction of OC's and PNA's will be explored (June to September 1982).
 - 3) Work on chlorophyll and vanadium-porphyrines methodology using HPLC will be completed and internal reports will be issued (April 1983).

NATIONAL WATER RESEARCH INSTITUTE

Study Plan

NO: 82-609

STUDY TITLE	Method for Phthalate Esters by High Pressure Liquid Chromatography	DIV OR ORG AMD
KEY WORDS	ANALYTICAL METHODS, PHTHALATE ESTERS	SEC'N OR GRP ACRS
STUDY LEADER	Afghan, B.K. TEL: 637-4661	PAE 4200
TEAM MEMBERS	J.F. Ryan	DATE 82/01/19
ECS PROGRAM	M.R.C.-Toxic Substances	
ACTIV ELEM	Toxic Substances	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

GOALS: To develop cleanup and quantitative method for Phthalate esters using high pressure liquid chromatography.

RELEVANCE: IJC have set water quality objectives for various Phthalate esters. Analytical capabilities group of Ontario region has recommended that method evaluation and development is required to meet surveillance requirements to monitor phthalte esters in the Great Lakes. This study will satisfy this need.

- WORK OUTLINE:
1. Literature search on available methodologies (October to November 1982).
 2. Set up of high resolution GC and HPLC cleanup systems for Phthalate esters (December 1982 to January 1983).
 3. Comparison of GC and HPLC Methods (February to March 1983).
 4. Based on the above, further work will be initiated in FY 83/84 to minimize the time of analysis, and carry out testing of method using environmental samples (water, sediment and fish).

Internal reports on the progress of the work will be submitted on periodic basis.

NATIONAL WATER RESEARCH INSTITUTE

Study Plan

NO: 82-610

STUDY TITLE	Consultation, Technology Transfer, Special Services, and Instrument Maintenance	DIV OR ORG AMD
KEY WORDS	ADMINISTRATION, ANALYTICAL METHODS, TECHNOLOGY TRANSFER	SEC'N OR GRP ACRS
STUDY LEADER	Afghan, B.K. TEL: 637-4661	PAE 4200
TEAM MEMBERS	J.F. Ryan, P.D. Goulden, D.H.J. Anthony, I. Sekerka, J.F. Lechner, F.I. Onuska, K. Terry and Chemist	DATE 82/01/19
ECS PROGRAM	M.R.C.-Toxic Substances	
ACTIV ELEM	Toxic Substances	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

- GOALS:
- 1) To provide on a continuing basis consultation and assistance to transfer methodologies, developed within ACRS, to end users.
 - 2) To provide specialized services using high resolution GC/MS and Clean and Hazardous Chemicals Laboratory (CHCL).
 - 3) To participate in the work of ASTM, ISO and other agencies engaged in the standardization of methods for chemical and biological parameters.

RELEVANCE: IWD and other agencies require on continuing basis the assistance due to specialized instrumentation, advanced technology and expertise that exists within ACRS. This study identifies this requirement as well as the cost associated to maintain ACRS instrumentation.

- WORK OUTLINE:
- 1) To maintain GC/MS system.
 - 2) To maintain HPLC and other instrumentation within ACRS.
 - 3) To assist WQB and technology transfer for TOC1, trace metals by ICAP, carbamate methodologies.
 - 4) To assist AED and EPS in the measurement of dissolved oxygen and cyano-metallic complexes in effluents.
 - 5) To participate in the work of ASTM and ISO.
 - 6) To support Dr. Onuska while on "Development Leave".
 - 7) To organize a workshop on capillary GC for WQB analytical chemists.

NATIONAL WATER RESEARCH INSTITUTE

Study Plan

NO: 82-615

STUDY TITLE	Methods Development and Confirmation of Contaminants in the GLB	DIV OR ORG AMD
KEY WORDS	METHODS DEVELOPMENT, CONTAMINANTS, MICROANALYSIS, LAKE ONTARIO, NIAGARA RIVER, TOXAPHENE, SEDIMENTS, FISH	SEC'N OR GRP ACRS
STUDY LEADER	Onuska, F.I. TEL: 637-4635	PAE 4200
TEAM MEMBERS	K. Terry and Chemist	DATE 82/01/19
ECS PROGRAM	M.R.C.-Toxic Substances	
ACTIV ELEM	Toxic Substances	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

GOALS: To develop reliable trace and ultratrace analytical methodologies for chlorinated camphenes in fish and sediments. To confirm the presence of trace contaminants using HRGC in tandem with high resolution mass spectrometry.

RELEVANCE: To improve and develop methodology for Toxaphene at trace levels using HRGC and GC/MS in fish and sediment.

WORK OUTLINE: 1) HRGC-ECD Analysis of Toxaphene in Fish and Sediments. April to October 1982.

2) Toxaphene methodology by GC/MS-qualitative and quantitative. June to November 1982; Report by February 1983.

3) Analysis of Sediment Samples by GC/MS from Lake Ontario in cooperation with ECD-NWRI by request. April 1982 to March 1983.

4) Analyses of extracts for confirmation will be provided to OAL-WQB - continuing.

Funded under TLWQA Project 1301

STUDY TITLE	Radioimmunoassay Techniques for Dioxins	DIV OR ORG AMD
KEY WORDS	ANALYTICAL METHODS, DIOXINS, METHODS DEVELOPMENT	SEC'N OR GRP ACRS
STUDY LEADER	Afghan, B.K. TEL: 637-4661	PAE 4200
TEAM MEMBERS	J. Sherry (MLS) and R.J. Wilkinson	DATE 82/01/19
ECS PROGRAM	M.R.C.-Toxic Substances	
ACTIV ELEM	Toxic Substances	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

GOALS: To evaluate and develop screening technique for chlorinated dioxins with special reference to 2,3,7,8-TCDD.

RELEVANCE: Radioimmunoassay has been proposed for preliminary screening of large number of samples for chlorinated dioxins and benzofurans. The method gives quantitative results when only a single dioxin isomer is present or semi-quantitative when applied to a mixture. This approach can be useful in eliminating large number of negative samples and thus can save more time on isomer-specific methods which are very expensive, time consuming and elaborate. Work for next two FY's will evaluate the above approach.

WORK OUTLINE: 1) Laboratory will be set up to carry out radioimmunoassay work (June 1982).

2) In-house expertise will be developed in collaboration with experts in U.S.A. and Canada in the area of radioimmunoassay (September 1982).

3) Samples will be screened for TCDD and the results compared to other techniques (December 1982).

4) Further work on improving the analytical scheme will be conducted in order to obtain more reliable results (March 1983).

Internal reports will be submitted to TCMP on the progress of work.

Funded under TCMP

NATIONAL WATER RESEARCH INSTITUTE

Study Plan

NO: 82-619

STUDY TITLE	Dioxins and Benzofurans Methodology	DIV OR ORG AMD
KEY WORDS	ANALYTICAL METHODS, DIOXINS, METHODS DEVELOPMENT	SEC'N OR GRP ACRS
STUDY LEADER	Afghan, B.K. TEL: 637-4661	PAE 4200
TEAM MEMBERS	R.J. Wilkinson	DATE 82/01/19
ECS PROGRAM	M.R.C.-Toxic Substances	
ACTIV ELEM	Toxic Substances	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

- GOALS:
1. To extend the scope of methodology for 2,3,7,8-TCDD to include fish, sediment, flyash and wastes.
 2. Work will also be initiated to include other isomers of polychlorinated dibenzo-p-dioxins and chlorinated benzofurans. The ultimate aim will be to develop cost effective and relatively fast methodologies for routine usage.
- RELEVANCE:
- There is considerable interest to improve the existing methodologies for chlorinated dioxins and benzofurans. The existing methodologies involve time consuming cleanup, quantitation and confirmation procedures. The primary aim of this study will be to evaluate various techniques and improve the existing procedure via automation or proper selection of appropriate cleanup techniques to provide fast, cost effective and reproducible analytical system for routine usage.
- WORK OUTLINE:
1. Methodology developed during FY 81/82, for the analysis of 2,3,7,8-TCDD will be extended to include all types of environmental samples. June 1982.
 2. The scope of the above methodology will be extended to include other isomers of polychlorinated dioxins and benzofurans. January 1983.
 3. The above methodology will be validated using environmental samples. March 1983.
 4. Documentation of above methodology in a form of internal report and for publication. May 1983.

Funded under GLWQA Project 1524

NATIONAL WATER RESEARCH INSTITUTE		Study Plan	NO: 82-621
STUDY TITLE	Media, Wash-up, Instrument and General Support		DIV OR ORG AMD
KEY WORDS	EQUIPMENT, FIELD SUPPORT, MICROBIOLOGY, BACTERIA		SEC'N OR GRP MLS
STUDY LEADER	McInnis, R.	TEL: 637-4581	PAE 1717
TEAM MEMBERS	Vacant position (GS-BUS-2)		DATE 82/01/20
ECS PROGRAM	Water Management Research		
ACTIV ELEM	Analytical Methods		

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

- GOALS:**
1. To provide, as required, media and wash-up support to the Microbiology Section, Special Services Section, and other NWRI and CCIW units requiring this service.
 2. To maintain common user equipment in good repair.
 3. To maintain cultures of bacteria.

RELEVANCE: Without this support no microbiology could be accomplished. During the last year, this unit provided the following wash-up and sterilization services: GLBL - 5 weeks, AMD non-microbiology - 2 weeks, ECO - 3 weeks, AED - 3 weeks, and EPS - 1 week. As well as Milli Q water for research purposes, this unit also prepared 57,800 agar petri dishes, 48,500 tubes of media and 1360 litres of various broths.

WORK OUTLINE: Through well established work patterns, supervision of staff, provide media, solutions, culture maintenance, chemicals and related glassware on demand to Microbiology staff and other AMD, NWRI, and CCIW staff.

STUDY TITLE	Legionella	DIV OR ORG AMD
KEY WORDS	METHODS DEVELOPMENT, BACTERIA, MICROBIOLOGY, HABITAT, RIVERS, LAKE WATER	SEC'N OR GRP MLS
STUDY LEADER	Dutka, B.J.	TEL: 637-4286 PAE 1717
TEAM MEMBERS	K. Walsh	DATE 82/01/20
ECS PROGRAM	Water Management Research	
ACTIV ELEM	Analytical Methods	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

GOALS:

1. To establish a reliable culturing and serological identification and publish the procedure in the IWD Microbiological Methods Manual.
2. To evaluate the distribution pattern of these organisms.
3. To evaluate the presence of the organisms in industrial setting and publication buildings.
4. To provide NH&W with data so that they can properly evaluate the potential hazards, if any, and relate biotype distribution with documented infections.
5. To evaluate the relationship of algae to Legionella, and the organic concentration, pH, temperature and Fe level to organism density.

RELEVANCE:

The reporting of infections by this organism (Legionnaires disease) has had great emotional impact on Canadians, even those working in related scientific fields. The reported very heavy densities of this organism in American rivers and lakes has aroused, perhaps undue concern to the populace. NH&W has indicated their interest in trying to establish the distribution pattern of this organism, to aid their epidemiological survey so that they can evaluate the potential hazards and perhaps mode of infection transmission.

WORK OUTLINE:

1. Set up laboratory for infectious material, train technician and familiarize ourselves with serological procedures. June.
2. Set up mobile lab - mid June.
3. Collect and process samples from Southern Ontario, Western and South eastern Quebec, (Halifax or Vancouver area) and Great Lakes (piggy-back on cruises), to investigate seasonal distribution. January.
4. Process samples collected by NH&W. January.
5. Results of 1982/83 study in report to NH&W and CCIW. March.
6. Prepare draft of methods for inclusion in Methods Manual. March.

STUDY TITLE	Effect of Acid Precipitation on Fungi in Fresh Water	DIV OR ORG AMD
KEY WORDS	ACID RAIN, BIOTA, BIODEGRADATION, ECOSYSTEM, FUNGI, LRTAP, MICROBIOLOGY	SEC'N OR GRP MLS
STUDY LEADER	Sherry, J.	PAE 4300
TEAM MEMBERS	K.K. Kwan	DATE 82/01/20
ECS PROGRAM	M.R.C.-LRTAP	
ACTIV ELEM	Long Range Transport of Airborne Pollutants - Aquatic	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

GOALS:

1. Review literature pertaining to effects of acid rain on fungi.
2. Adapt existing mycological techniques for enumeration and isolation of fungi from acid stressed lakes.
3. Establish baseline data in hard and soft water lakes.
4. Compare fungal populations in acid and non acid stressed lakes.
5. Modify procedures and adapt them to assess role of fungi in the decomposition of organic matter in acid stressed lakes.

RELEVANCE:

1. Fungi, which play a key role in degradation and recycling of organic matter, grow better under acid conditions than do the majority of bacteria. Changes should occur in the relative predominance of fungi and bacteria in acid stressed environments.
2. Fungi, however, are sensitive to SO_3^{2-} and HSO_3^- ions, these ions are solubility products of SO_2 in H_2O and may thus prevent the anticipated advantage of fungi in acidified aquatic environments.

WORK OUTLINE:

1. Search literature for papers relating to the effects of acid rain on fungi; collect and review articles, synthesize information into report form. July 1, 1982.
2. Adapt, modify existing techniques for enumeration of geo-aquatic fungi, yeasts-phycomycetes. January 1983.
3. Modified methods to be prepared for Methods Manual. March 1983.
4. Train technician on advanced microbiological techniques.
5. Adapt baiting technique for examination of substrate colonization. June 1983.
6. Analyze several sets of water samples from hard and soft water lakes. Reports May 1983 and May 1984.

STUDY TITLE	Microbial Nitrogen Cycle Methodology	DIV OR ORG AMD
KEY WORDS	ACID RAIN, BACTERIA, NITROGEN, MICROBIOLOGY	SEC'N OR GRP MLS
STUDY LEADER	Dutka, B.J. TEL: 637-4286	PAE 4300
TEAM MEMBERS	Jova, A.	DATE 82/01/20
ECS PROGRAM	M.R.C. - LRTAP	
ACTIV ELEM	Long Range Transport of Airborne Pollutants - Aquatic	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

GOALS:

1. To review methodology for enumerating nitrogen cycle bacteria in water and sediments and evaluate against techniques now being used to assess impact of acid rain on aquatic microbial populations.
2. To evaluate pH level and buffering capacity below which nitrification and denitrification processes are hindered or cease in acid stressed waters.

RELEVANCE:

Recent studies have indicated that the nitrification process is slowed or inhibited in lakes subjected to acid rain. One of the ways of testing for nitrification potential is through the measurement of specific heterotrophic bacteria which are involved in aquatic nitrification. The procedures routinely used by most laboratories have been derived from soil microbiology and may not be as efficient or sensitive as some of the new proposed procedures. Thus, before stating unequivocally that nitrification or the potential for nitrification is lost with decreasing pH, it seems appropriate to investigate newer and perhaps more sensitive techniques. Similarly, it is believed that there may be a pH level below which the denitrification process is hindered and we propose to evaluate this facet along with reviewing present methodology.

WORK OUTLINE:

1. Review literature for procedures - July 1982 - techniques chosen to evaluate.
2. Evaluate techniques in lab and field - December 1982 - data to evaluate.
3. Evaluate effect of pH on nitrifying populations through aquaria studies on chemostat - June 1983 - data for evaluation for report.
4. Prepare reports on steps 1 - 2. March - April 1983.
5. Using techniques selected by steps 2 and 3. Application of technique to field studies. April 1983 - February 1984 by Dr. Rao as part of study 683.
6. Final Report by Dr. Rao.

STUDY TITLE	Bacterial Toxicity Workshop	DIV OR ORG AMD
KEY WORDS	TOXIC SUBSTANCES, WORKSHOP, BACTERIA	SEC'N OR GRP MLS
STUDY LEADER	Dutka, B.J. TEL: 637-4286	PAE 4200
TEAM MEMBERS	D.L.S. Liu	DATE 82/01/20
ECS PROGRAM	M.R.C.-Toxic Substances	
ACTIV ELEM	Toxic Substances	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

GOALS: To plan, organize and hold symposium on Toxicity Testing Using Bacteria. (May 17 to 19, 1983).
To publish proceedings of symposium.

RELEVANCE: Microbiologists at NWRI have been involved in the evaluation of various toxicity screening tests using bacteria for several years and have noted the reluctance of Dept. of Environment managers to adopt such procedures for monitoring toxic chemicals in water and effluent samples. Bacteriological toxicity tests have recently gained international recognition as a means of more efficient, economical and reliable procedure for screening chemical toxicity in environmental samples. Consequently, several European countries have included such procedures into their official government standards.
This symposium will bring an international view to Canadian managers and will provide a forum for researchers in bacterial toxicity tests.

WORK OUTLINE: 1. Mailing list preparation, brochure design and mailing request for papers. April 1, 1982.
2. Initiate procedures to get 4-6 session chairmen. August 1982.
3. Review submitted papers - prepare list of papers. Send out second brochure. November 15, 1982.
4. Final mailing completed program. February 15, 1983.
5. Hold symposium and organize symposium committee. May 20, 1983.
6. Organize papers for publication. August 1983.

NATIONAL WATER RESEARCH INSTITUTE

Study Plan

NO: 82-628

STUDY TITLE	Bacterial Water Quality Surveillance Lower Lakes	DIV OR ORG AMD
KEY WORDS	SURVEILLANCE, BACTERIA, LAKE ONTARIO, IJC, MICROSCOPY, MICROBIOLOGY	SEC'N OR GRP MLS
STUDY LEADER	Rao, S.S. TEL: 637-4312	PAE 1717
TEAM MEMBERS	A.A. Jurkovic	DATE 82/01/20
ECS PROGRAM	Water Management Research	
ACTIV ELEM	Analytical Methods	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

- GOALS: To complete the surveillance work undertook in 1981/82. To provide information to the IJC with a detailed assessment on the main lake conditions as compared to the conditions in 1976/77. (Work conducted for Ontario Region).
- RELEVANCE: The Microbiology Laboratories CCIW have provided the IJC information on baseline bacterial level in Lake Ontario (see IJC Surveillance Subcommittee Report 1977) and it was proposed to provide followup information during 1981/83. (IJC Executive Summary Great Lakes International Survey Plan, Table 1). The information will form a base for setting non-degradative water quality standards/objectives.
- Input required under Canada/U.S. Agreement and Water Quality Board Annual Report to the IJC.
- The study adheres to the IJC surveillance plan.
- WORK OUTLINE: To ascertain water quality conditions in the lake, four to six surveys will be made before mid December.
- Samples collected from different depths for various microbiological parameters (eutrophication parameters will be reviewed).
- Basic parameters will be augmented depending on on-shore installations.
- Data will be examined and reports prepared for IWD Ontario Region with recommendations (March).

STUDY TITLE	Quality Assurance and Methods Section - Administration and Measurement	DIV OR ORG AMD
KEY WORDS	ADMINISTRATION, QUALITY CONTROL, METHODS DEVELOPMENT	SEC'N OR GRP QAMS
STUDY LEADER	Chau, A.S.Y. TEL: 637-4653	PAE 1611
TEAM MEMBERS		DATE 82/01/22
ECS PROGRAM	Water Management Data	
ACTIV ELEM	Data Quality Assurance	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

- GOALS: To administer and participate in the activities and projects of the Section to ensure the objectives are met and maximum efficiency on the execution of projects of the Section.
- RELEVANCE: To ensure the objectives set for the Section are met and the activities carried out efficiently.
- WORK OUTLINE:
- 1) To participate in evaluation of experimental data from method development and of data from quality control studies.
 - 2) To evaluate data and results of projects at various intervals of projects in the Section and recommend change of working arrangement if necessary for the best route to achieve the objectives of the projects.
 - 3) To carry out general administration in the Section.
 - 4) To write, direct the writing or participate in writing reports of QC studies and method development.
 - 5) To serve as a General Referee of the Association Official Anal. Chemists to evaluate methodology recommendation and reports of collaborative studies from associate referees for the selection of "official" methods and report activities annually in the AOAC meeting in Washington.
 - 6) To serve as a Task Group Chairman in ASTM (attend one of the two meetings).

NATIONAL WATER RESEARCH INSTITUTE

Study Plan

NO: 82-642

STUDY TITLE	FICP Quality Control Studies	DIV OR ORG AMD
KEY WORDS	QUALITY CONTROL, INTERLABORATORY STUDIES	SEC'N OR GRP QAMS
STUDY LEADER	Chau, A.S.Y.	TEL: 637-4653 PAE 4200
TEAM MEMBERS	H.B. Lee	DATE 82/01/22
ECS PROGRAM	M.R.C.-Toxic Substances	
ACTIV ELEM	Toxic Substances	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

GOALS: This is a continuing activity to develop and execute a quality assurance program and collaborative study on organics in water. Due to the lack of manpower, only one small check sample study for FICP (Federal Interdepartmental Committee for Pesticides) will be carried out.

RELEVANCE: To present IWD and fulfill the interdepartmental agreement on pesticide analysis under the auspices of the Federal Interdepartmental Committee on Pesticides.

WORK OUTLINE: To design and run a quality control study for OC's in water or sediment for FICP. Selection of water or sediment will be made after consultation with participating laboratories.

- 1) Questionnaire to FICP to check sample members (September 1982).
- 2) Design a study following FICP requirements and communicate with Chairman of FICP to check sample program.
- 3) Check design and distribute samples (December 1982).
- 4) Compilation and interpretation of data.
- 5) Report writing (March 1983).
- 6) Attendance at Eastern or Western Annual Workshop on Pesticides Analysis in May 1982 to communicate with participants before study is undertaken.

Study will be completed by March 1983.

01/01/82

Approval _____

FORM A, PART 1

STUDY TITLE	Interregional Quality Control Program: WQB Methods Manual	DIV OR ORG AMD
KEY WORDS	QUALITY CONTROL, INTERLABORATORY STUDIES, ANALYTICAL METHODS	SEC'N OR GRP QAMS
STUDY LEADER	Chemist	TEL: PAE 1611
TEAM MEMBERS		DATE 82/01/22
ECS PROGRAM	Water Management Data	
ACTIV ELEM	Data Quality Assurance	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

- GOALS:
1. At the request of Headquarters, conduct monthly or sometimes bi-monthly monitoring to ensure comparability of the data generated by regional laboratories, advise regional labs on analytical problems.
 2. Generate interlaboratory accuracy, precision and detection limit statements for methods in the WQB Analytical Methods Manual by special studies.
- RELEVANCE:
1. The bimonthly interlaboratory program is in response to Headquarters' request to meet the needs expressed by regional WQB laboratories. Minor analytical problems discovered in the studies are followed up by advice and suggestions to regional laboratories. Those problems reflecting deficiency of analytical methodology will be investigated by the Section on method development projects.
 2. To generate specification statements on all methods used by the WQB laboratories in Canada so that the data generated by these methods can be interpreted with demonstrated degree of confidence.
- WORK OUTLINE:
- a) To prepare and check test samples for interregional and specification studies (on going).
 - b) To distribute every 2 months, test samples for 40 inorganics and some organic parameters to 5 WQB labs across Canada and to comprehensively analyze data for 'problem areas' and to evaluate and document the variance between laboratories (report issue to WQB laboratories and headquarters approximately every 2 months).
 - c) To continue phase II of the specification program at low levels (det. limit or 10 times det. limit) for trace metals and major ions. Ongoing using special studies and results of (b) above. 2 reports to regional lab expected.
 - d) To design and execute organic specification studies for a minimum of two methods (O.C. and PCB's in sediments, waters and others). Two reports to regional and headquarters within 2 months of receiving data from laboratories.

STUDY TITLE	Development of Standard Reference Materials and Reference Materials	DIV OR ORG AMD
KEY WORDS	TOXIC SUBSTANCES, QUALITY CONTROL, STANDARD REFERENCE MATERIAL	SEC'N OR GRP QAMS
STUDY LEADER	Cheam, V. TEL:	PAE 1611
TEAM MEMBERS	A.S.Y. Chau	DATE 82/01/22
ECS PROGRAM	Water Management Data	
ACTIV ELEM	Data Quality Assurance	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

- GOALS: To continue developing and evaluating standard reference materials and reference materials for major ions in water and for mercury, arsenic and selenium in sediment. SRM's are needed for determination of absolute accuracy in quality control studies, method evaluation, calibration and development.
- RELEVANCE: There are no suitable SRM's for major ions in water or for Hg, As and Se in sediment for intra- and inter-laboratory quality control studies. SRM's are invaluable for evaluating and assessing new methods and are universal calibrants.
- WORK OUTLINE:
1. Major Ions in Water (ref. 656)
 1. Investigate feasibility studies on sterilization of samples as a means of stabilizing constituents. Support is needed from microbiology section. If successful, the study probably will continue for 2 to 3 years (April).
 2. In-house analysis (May).
 3. Arrange contracting out of samples by selecting contract labs using information from the national Q.C. study (July).
 4. Continue and finalize stability of cold room storage (Sept.)
 5. Pool and treat all data from in-house, interlab and contract works (November).
 6. Report writing (March 1983).
 2. Mercury, Arsenic and Selenium in Sediment
 1. Continue in-house analysis on two RM's for the 3 elements (September).
 2. Review all data from contracts, interlab and in-house data and statistically pool and treat data (December).
 3. Report writing (April).

STUDY TITLE	Method Adaptation for WQB Laboratories	DIV OR ORG AMD
KEY WORDS	TOXIC SUBSTANCES, METHODS DEVELOPMENT	SEC'N OR GRP QAMS
STUDY LEADER	Cheam, V. TEL: 637-4645	PAE 4200
TEAM MEMBERS	A.S.Y. Chau	DATE 82/01/25
ECS PROGRAM	M.R.C.-Toxic Substances	
ACTIV ELEM	Toxic Substances	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

- GOALS:
1. To validate and develop analytical methods for arsenic and selenium in seaweed.
 2. Replacement of benzene in existing WQB method for O.C.'s and PCB's in water.

RELEVANCE: Reliable Analytical methods are requested by regional WQB labs.

WORK OUTLINE: Arsenic and Selenium

1. Literature search, obtain seaweed from region, evaluate and develop method (June).
2. Application to various samples and methods (August).
3. Write-up (September). Report to WQ Branch Regional lab.

Organic

1. Literature review and obtain water from region (November).
2. Select and evaluate solvents (e.g. hexane and MeCl_2) as replacement on clear and turbid water (February 1983).
3. Evaluate previous and present data (March 1983).
4. Write developed procedure for WQB method manual.

NATIONAL WATER RESEARCH INSTITUTE

Study Plan

NO: 82-646

STUDY TITLE	Method Developments for Herbicides	DIV OR ORG AMD
KEY WORDS	TOXIC SUBSTANCES, METHODS DEVELOPMENT	SEC'N OR GRP QAMS
STUDY LEADER	Chemist	TEL: PAE 4200
TEAM MEMBERS		DATE 82/01/25
ECS PROGRAM	M.R.C.-Toxic Substances	
ACTIV ELEM	Toxic Substances	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

- GOALS:
- To complete method for the analysis of 10 acid herbicides in water, and for the analysis of TCA and Dalapon in water and in sediments.
 - To integrate the analysis of 10 acids and 7 neutral herbicides with the analysis of TCA and Dalapon in water and in sediment.
 - To develop a method for avenge in water and in sediment.

RELEVANCE: This study will complete the request of WQB (Western Region).

- WORK OUTLINE:
- Extended literature method, slight modification, if necessary (May).
 - Extraction, cleanup and sample applicability of the developed method to natural waters (August).
 - Report with single operator statement on precision, accuracy and detection limit at 2 to 3 concentration levels (September).
- B)
- Integrate the analysis and provide overall single operator statement as above (January 1983).
- C)
- Literature search and mode of analysis.
 - Extraction investigation.
 - Cleanup and sample application to natural water (February).
 - Report with single operator statement (by March).

01/01/82

Approval _____

FORM A, PART 1

NATIONAL WATER RESEARCH INSTITUTE		Study Plan	NO: 82-653
STUDY TITLE	IJC Quality Assurance Study		DIV OR ORG AMD
KEY WORDS	INTERNATIONAL JOINT COMMISSION, INTERLABORATORY STUDIES		SEC'N OR GRP QAMS
STUDY LEADER	K.I. Aspila (Inorganic) A.S.Y. Chau (Organic)	TEL: 637-4638 637-4553	PAE 1103
TEAM MEMBERS			DATE 82/01/25
ECS PROGRAM	Canada-U.S. and Interprovincial Waters		
ACTIV ELEM	Surveillance/Monitoring		

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

GOALS: To carryout the Data Quality Work Group IJC Quality Assurance program to identify comparable laboratory performance and through the DQWG inform analysts and responsible program managers of inadequacies and unsatisfactory performance.

RELEVANCE: To respond to the needs of the IJC Data Quality Work Group and to the needs of the Canadian IJC Laboratories who contribute data to the GLWQ programs.

WORK OUTLINE: Inorganics

1. Organize bottles, confirm design of each study and package and distribute studies on total P, major ions and trace metals in water (June through September).
2. Evaluate data and prepare reports (July, August, October).
3. Prepare new samples, acquire new waters (on-going).
4. Perform necessary duties as member and chairman of the DQWG.

Organics Part I. Certification of the 1981 Lake Ontario sediments for Chlorobenzenes (Phase II); Phase I (acquisition of sediment) was completed in 81/82.

5. Analyse samples, confirm homogeneity, and stability of parameters (September 1982).
6. Select contract labs, perform repetitive analyses, evaluate data and prepare report (March 1982).

Part II. Acquisition of a 1982 sediment containing higher levels of priority contaminants.

7. Review data, select location, collect sample (July 1982).
8. Obtain some preliminary data (September 1982).
9. Process and bottle sediment (approx. 10,000 bottles) (Jan. 1983)
10. Contract analysis (1st phase) (March 1982).

NOTE: Since no PY is available other than 1 PY A Base, analyses will be done by contract labs. The above milestones for organics are rough estimates only. Success will depend on the quality and cooperation of the contract labs.

1/01/82

Approval _____

FORM A, PART 1

NATIONAL WATER RESEARCH INSTITUTE

Study Plan

NO: 82-654

STUDY TITLE	Prairie Provinces Water Board Quality Assurance Program	DIV OR ORG AMD
KEY WORDS	INTERLABORATORY STUDIES, ANALYTICAL METHODS	SEC'N OR GRP QAMS
STUDY LEADER	Chemist	TEL: PAE 1611
TEAM MEMBERS		DATE 82/01/25
ECS PROGRAM	Water Management Data	
ACTIV ELEM	Data Quality Assurance	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

- GOALS:
1. To establish comparability and compatability of methods used in Prairie Provinces Water Quality laboratories.
 2. To assist the provincial labs quality assurance program.
 3. To assist the Prairie Provinces Water Board (PPWB) and its member agencies in establishing a compatible long-term water quality data base in Alberta, Saskatchewan and Manitoba.
- RELEVANCE:
- The need to satisfy the above goals is recognized and recommended by the Prairie Provinces Water Board. See "A" program for assessing and improving the comparability of WQ Data generated by the federal and the provincial laboratories. April 1981, PPWB.
- WORK OUTLINE:
- 1) To expand existing WQB interlaboratory studies to include 3 PPWB member laboratories (2 studies bimonthly) - continuing.
 - 2) To add at least 3 special samples per study to cover 3 additional parameters (As, Hg and P).
 - 3) To generate a computer program including graphic presentation for data and method comparison (October 1982).
 - 4) Prepare and validate reference materials (RM's) to be used in the Q.C. studies - continuing.
 - 5) Six reports will be generated within 1 month of receiving data.
 - 6) An overall report on the average performance will also be provided on a yearly basis.

STUDY TITLE	Interlaboratory Quality Assurance Program: TCMP	DIV OR ORG AMD
KEY WORDS	INTERLABORATORY STUDIES, TOXIC SUBSTANCES, STANDARD REFERENCE MATERIAL	SEC'N OR GRP QAMS
STUDY LEADER	Lee, H.B. TEL:	PAE 4200
TEAM MEMBERS	A.S.Y. Chau	DATE 82/01/25
ECS PROGRAM	M.R.C.-Toxic Substances	
ACTIV ELEM	Toxic Substances	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

- GOALS:
1. Development of SRM's for PAH's and chlorobenzene and O.C.'s in sediment.
 2. Quality Assurance study for organochlorine and PCB's.
- RELEVANCE:
- There is an urgent demand to increase the number of organic compounds included in the IWD interregional quality control program. This will involve increased effort in standardization of methodologies, the preparation and certification of standard reference materials as well as the implementation of the actual quality control activities.
- WORK OUTLINE:
1. Continuation of the development of SRM's
 - a) Chlorobenzenes (2nd Phase) in sediment
 - Set up capillary GLC for in-house analysis (May 1982)
 - To use different key analytical methods for analysis (July)
 - Check homogeneity of subsamples (July to September)
 - Contract out analysis, evaluate contract lab and in-house data and obtain a preliminary "true" value by November 1982
 - Select contact labs for GC/MS analysis certification and report by February
 - b) PAH's (1st phase)
 - Evaluate preliminary contract lab data of 81/82, select lab(s) and contract out 30 to 50 PAH's analysis (October to March).
 - Set up in-house HPLC analysis on PAH's in sediment (March 1983) and evaluate our master computer program for toxic chemical Q.C. data (March 1983).
 2. Q.A. Studies
 - Final report on PCB's study by September 1982.
 - For a Q.C. study on OC's in sediment, investigate stability, design and in-house analysis of test samples (October to November 1982).
 - Write a report on the QC study (March).
 3. Long Term Stability of SRM's
 - Monitoring stability of all SRM's. Gather data for future publications (continuing).

NATIONAL WATER RESEARCH INSTITUTE

Study Plan

NO: 82-659

STUDY TITLE	LRTAP Quality Assurance Program (Phase 1)	DIV OR ORG AMD
KEY WORDS	ACID RAIN, PRECIPITATION, QUALITY CONTROL, INTER-LABORATORY STUDIES	SEC'N OR GRP QAMS
STUDY LEADER	Aspila, K.I. TEL: 637-4638	PAE 4300
TEAM MEMBERS	LRTAP PY (Pending)	DATE 82/01/25
ECS PROGRAM	M.R.C.- LRTAP	
ACTIV ELEM	Long Range Transport of Airborne Pollutants - Aquatic	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

- GOALS: Design, prepare, confirm, implement, interpret and report on multi-sample interlaboratory studies that address and examine the lab measurement process for the soft water substrates pertinent in the LRTAP. The constituents are to include various major ions, pH, alkalinity, acidity and conductance.
- RELEVANCE: To respond to the quality assurance needs identified by the LRTAP quality assurance subgroup through an interlab evaluation program (approximately 15 to 30 labs) and provide federal and provincial LRTAP analysts, lab heads, managers and users of data with an assessment of the quality of laboratory data.
NOTE: This study has been designed assuming that 1 PY will be made available. If more PY's are supplied, the study will be expanded accordingly (see complete LRTAP-QA proposal). (Refer to the 1982 LRTAP quality assurance resource proposal).
- WORK OUTLINE: (Timetable is subject to LRTAP financial and PY support).
1. Identify, contact and confirm participating laboratories (April to July).
 2. Confirm and notify the interpretation process (April to Aug.).
 3. Collect, organize and confirm constituents in bulk water samples. Prepare synthetic water standards (April to Aug.).
 4. Prepare, organize and distribute interlab studies (July to Mar.).
 5. Collect data, interpret and prepare reports for the quality assurance subgroup (September 82 to March 83).
 6. Meeting of Analysts (November 82 or February 83). Note: Three to five interlab studies are possible. The frequency, size of study, the parameter group and schedule is subject to the "stock of waters", lab programs and the needs identified by the LRTAP QA subgroup.

01/01/82

Approval _____

FORM A, PART 1

STUDY TITLE	Computer Services for Water Management Research	DIV OR ORG AMD
KEY WORDS	COMPUTER	SEC'N OR GRP CSS
STUDY LEADER	Pulley, H.C. TEL: 637-4209	PAE 1700
TEAM MEMBERS	M. Kinder, B. Malseed, U. Hamilton, J. Foley, P. Moody	DATE 82/01/25
ECS PROGRAM	Water Management Research	
ACTIV ELEM	General	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

- GOALS: Provide centralized computing, plotting, and keypunch services to all components of the Canada Centre for Inland Waters and external users approved by the Director, NWRI.
- RELEVANCE: This is a support service required for most areas of activity at CCIW.
- WORK OUTLINE: This study involves ongoing research support. The quality of this support will be maintained by:
- 1) Providing operating staff for the installation for a minimum of nine hours per working day;
 - 2) Analysing, and if feasible, installing all CYBER 171 software releases within two months of delivery;
 - 3) Striving for a minimum monthly up-time for the CYBER 171 of 95% of scheduled production hours;
 - 4) Evaluating future computing requirements in readiness for the replacement of the present system in 1984. This evaluation will be conducted cooperatively with the Data Management Section.

NATIONAL WATER RESEARCH INSTITUTE

Study Plan

NO: 82-681

STUDY TITLE	CAPITAL EQUIPMENT ACQUISITION (ACRS)	DIV OR ORG AMD
KEY WORDS	METHODS DEVELOPMENT	SEC'N OR GRP AMDDIV
STUDY LEADER	Lawrence, J.	TEL: 637-4319 PAE 1717
TEAM MEMBERS		DATE 82/01/14
ECS PROGRAM	Water Management Research	
ACTIV ELEM	Analytical Methods	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

GOALS:

1. To purchase capital equipment necessary for the implementation of 82/83 study plans.
2. To acquire capital equipment necessary for the maintenance of expertise within AMD.
3. To replace obsolete equipment in accordance with the long-term replacement plan.

RELEVANCE:

To fulfill the responsibilities of the Analytical Methods Division requires acquisition of new instrumentation reflecting the latest advances in analytical technology and to replace obsolete, existing instrumentation.

WORK PLAN:

1. To prepare specification sheets and purchase requisition for instrumentation detailed in Form 4.
2. In cooperation with DSS arrange purchase of this equipment in a timely manner.

01/01/82

Approval _____

FORM 1

STUDY TITLE	CAPITAL EQUIPMENT ACQUISITION (QAMS)	DIV OR ORG AMD
KEY WORDS	QUALITY CONTROL, METHODS DEVELOPMENT	SEC'N OR GRP AMDDIV
STUDY LEADER	Lawrence, J TEL: 637-4319	PAE 1611
TEAM MEMBERS		DATE 82/01/14
ECS PROGRAM	Water Management Data	
ACTIV ELEM	Data Quality Assurance	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

- GOALS:
1. To purchase capital equipment necessary for the implementation of 82/83 study plans.
 2. To acquire capital equipment necessary for the maintenance of expertise within AMD.
 3. To replace obsolete equipment in accordance with the long-term replacement plan.

RELEVANCE: To fulfil the responsibilities of the Analytical Methods Division requires acquisition of new instrumentation reflecting the latest advances in analytical technology and to replace obsolete, existing instrumentation.

- WORK PLAN:
1. To prepare specification sheets and purchase requisitions for instrumentation detailed in Form 4.
 2. In cooperation with DSS arrange purchase of the equipment in a timely manner.

STUDY TITLE	Acid Rain Effects on Microbial Response in Aquatic Ecosystems	DIV OR ORG AMD
KEY WORDS	ACID RAIN, BACTERIA, BIODEGRADATION, (LRTAP), MICROSCOPY, MICROBIOLOGY	SEC'N OR GRP MLS
STUDY LEADER	Rao, S.S. TEL: 637-4312	PAE 4300
TEAM MEMBERS	A.A. Jurkovic	DATE 82/01/20
ECS PROGRAM	M.R.C.-LRTAP	
ACTIV ELEM	Long Range Transport of Airborne Pollutants - Aquatic	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

GOALS:

1. To understand the effects of acid stress on microbial populations and processes.
2. To establish data base for lakes with varying pH ranges on water quality information. To determine seasonal trends and to define cause-effect relationships to developed predictive models.
3. To determine indicator organisms that can be used to predict changes in lakes.

RELEVANCE:

Microbial processes are essential in food chain and nutrient cycling processes to maintain a balanced ecosystem. However, pH is one of the major factors effecting the microbial processes (e.g., nitrification) thus buildup of undecomposed or biologically resistant products. Acidophilic or anaerobic bacteria may provide sensitive technique to establish health of the lakes, its rate of decline or rate of resuscitation due to control measures and to categorize lakes for priority studies.

WORK OUTLINE:

1. This is similar to previous study 1980/82, but in different geographical location. Field work includes Bacteriological data collection in a group of 6 to 8 hard and soft water lakes near Sudbury area. April 1982 to March 1983.
Data analysis of field study and summary December 1982 - March 1983 (to be submitted to the LRTAP Program Co-ordinator).
- information on baseline bacteriological data for monitoring.
2. Laboratory studies - performed using environmental chambers on bacterial degradation of organic matter. November 1982 - March 1983.
- Acid Stress Effects on Microbial Processes. End of March 1983. Summary report on work status.
3. End of 1983/84. Detailed report output. The 1982/83 work report will be included as part of the report on overall ongoing limnology of acid lakes program. Final report for 4 year study will be completed by the end of FY 1983/84.

TECHNICAL OPERATIONS DIVISION

SECTION	STUDY	STUDY TITLE	STUDY LEADER
TOPDIV	801	DIVISION MANAGEMENT AND ADMINISTRATION	MACDONALD, H. B.
TOPDIV	802	LOGISTIC SUPPORT TO NWRI, FIELD SUPPORT AND VEHICLES	TAYLOR, W. B.
TOPDIV	803	OPEN LAKES SURVEILLANCE SUPPORT	HEALEY, P. M.
TOPDIV	804	COMMON-USER EQUIPMENT MAINTENANCE	TAYLOR, W. B.
TOPDIV	805	CORING SUPPORT	MAWHINNEY, M. R.
TOPDIV	806	SUPPORT TO EXTERNAL AGENCIES	MACDONALD, H. B.
TOPDIV	807	MET. SYSTEMS, SHIPBOARD ELECTRONICS, MET. DATA EDITING	DIAZ, J. A.
TOPDIV	808	LIMNOLOGICAL INSTRUMENTATION SUPPORT	DIAZ, J. A.
TOPDIV	809	OPEN HOUSE '82	MACDONALD, H. B.

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STUDY TITLE	Division Management and Administration	DIV OR ORG T/OPS
KEY WORDS	Administration, field support, management	SEC'N OR GRP TOPDIV
STUDY LEADER	Macdonald, H.B. TEL: 637-4217	PAE 1700
TEAM MEMBERS	S.R. Mitchell	DATE 82/01/26
ECS PROGRAM	Water Management Research	
ACTIV ELEM	General	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

1. To provide planning, direction, coordination and control of technical support to scientific studies.
2. To provide efficient administration of departmental regulations and to ensure complete and accurate records.

Relevance:

To ensure that the quality of support to scientific programs is maintained and that funds are expended efficiently and in conformity with Departmental regulations.

Work Outline:

1. Division Chief:
Provides direction for the support to scientific programs, decides priorities, establishes objectives and goals, allocates funds and approves expenditures within authority.
2. Secretary:
Provides for office management and records of correspondence and studies.
Types all cruise plans and reports. Arranges for meetings, takes minutes and greets visitors.

STUDY TITLE	Logistic Support to NWRI, Field Equipment and Vehicles	DIV OR ORG T/OPS
KEY WORDS	Equipment, field support	SEC'D OP GRP TOPDIV
STUDY LEADER	Taylor, W.B. TEL: 637-4216	PAE 1700
TEAM MEMBERS	W.D. Hunt, G.H. Perigo	DATE 82/01/26
FCS PROGRAM	Water Management Research	
ACTIV ELEM	General	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

1. To provide Warehousing and Field Equipment Stores in support of all NWRI studies.
2. To provide common vehicle pool in support of all scientific activities conducted from CCIW.

Relevance:

1. To ensure that an established level of field stores is maintained and that the funds are expended efficiently and in conformity with Departmental regulations.
2. To meet the requirements of the Departmental Motor Vehicle Fleet Management in all respects.

Work Outline:

1. Maintain a common-user Field Stores in support of scientific programs. Keeps records and inventory files.
2. Maintains a vehicle maintenance schedule. Keeps monthly logs on all vehicles.

STUDY TITLE	Open Lakes Surveillance Support	DIV OR ORG T/OPS
KEY WORDS	Surveillance, IJC, water quality	SEC'N OR GRP TOPDIV
STUDY LEADER	Healey, P.M. TEL: 637-4215	PAE 1103
TEAM MEMBERS	Various Technical Operations Division Staff	DATE 82/01/26
ECS PROGRAM	Canada-U.S. and Interprovincial Waters	
ACTIV ELEM	Surveillance/Monitoring	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

1. To provide a continuing report on long-term trend information of water quality and eutrophication parameters in the Great Lakes.
2. To provide input required for the Surveillance Program under the Canada/U.S. Agreement and Water Quality Board Annual Report to the International Joint Commission.

Work Outline:

To provide the support and expertise to carry out the Surveillance and Bioindex Monitoring Programs by:

1. Logistics management and coordination of the Program.
2. Technical support.
3. Writing of cruise plans and reports.
4. Writing of preliminary descriptive reports.
5. Input to the "Surveillance Working Committee".
6. Technical and logistics support to Canadian Wildlife Service.
7. Technical and logistics support to Great Lakes Biolimnology Laboratory.

STUDY TITLE	Common-User Equipment Maintenance	DIV OR ORG T/OPS
KEY WORDS	Capital, equipment, field suport	SEC'N OR GRP TOPDIV
STUDY LEADER	Taylor, W.B. TEL: 637-4216	PAE 1700
TEAM MEMBERS	J.A. Diaz, M.R. Mawhinney, P.N. Healey	DATE 82/01/26
ECS PROGRAM	Water Management Research	
ACTIV ELEM	General	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

To maintain all field support equipment in good order as well as provide for upgrading of field equipment and replacement of lost, damaged or worn-out equipment.

Relevance:

To ensure the level of support to NWRI field studies is adequate to fulfil needs.

Work Outline:

1. Inventory all capital equipment now under the responsibility of Technical Operations Division and report on the condition and utilization of such equipment.
2. Develop and implement plan for upgrading or replacement of lost, damaged or worn-out equipment.

STUDY TITLE	Coring Support	DIV OR ORG T/OPS
KEY WORDS	Equipment, sediments, benthos, geochemistry	SEC'N OR GRP TOPDIV
STUDY LEADER	Mawhinney, M.R. TEL: 647-4215	PAE 1700
TEAM MEMBERS		DATE 82/01/26
ECS PROGRAM	Water Management Research	
ACTIV ELEM	General	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

1. To provide logistic management and technical support for scientific projects to CCIW, regional and outside agencies.
2. To continue coring support to the various agencies for continuing studies.
3. To maintain all coring equipment under the Technical Operations jurisdiction. The system and expertise presently available to provide coring support reside within Technical Operations.
4. To investigate new equipment on the market and arrange for demonstration for scientific users.
5. To implement the purchase of new equipment when required to fulfill the demands of our scientific leaders.
6. To ensure that all procedures, instrumentation description and software programs are documented and manuals completed for field and office personnel.

STUDY TITLE	Support to External Agencies	DIV OR ORG T/OPS
KEY WORDS	Field support, equipment, instrumentation	SEC'N OR GRP TOPDIV
STUDY LEADER	Macdonald, H.B. TEL: 637-4217	PAE 1920
TEAM MEMBERS	J.A. Diaz, P.M. Healey, M.R. Mawhinney, W.B. Taylor	DATE 82/01/27
ECS PROGRAM	Management and Administration	
ACTIV ELEM	Support Services to Others	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

To provide logistic support, equipment, instrumentation and field party manpower to the following agencies outside NWRI:

1. Great Lakes Biolimnology Laboratory, DFO.
2. Bayfield Laboratory for Marine Science & Surveys, DFO.
3. Lands Directorate.
4. Policy Research & Social Analysis, IWD, OR.
5. Universities.
6. Inland Waters Directorate, Ontario Region.

Relevance:

The efficient utilization of support resources at Burlington reduces the need for duplication and increased Government spending on programs which are closely related.

Work Outline:

1. Provide support to external agencies as possible within the resources allocated.
2. Provide technical advice and guidance as requested.

STUDY TITLE	Meteorological Systems, Shipboard Electronics, Meteorological Data Editing	DIV OR ORG T/OPS
KEY WORDS	Equipment, instrumentation	SEC'N OR GRP TOPDIV
STUDY LEADER	Diaz, J.A. TEL: 637-4691	PAE 1700
TEAM MEMBERS	E.G. Smith	DATE 82/01/27
ECS PROGRAM	Water Management Research	
ACTIV ELEM	General	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

1. To provide instrumentaton, field support, data processing and analysis of meteorological, water temperature and solar radiation data for NWRI, regional and outside agencies.
2. Twelve-to-fifteen meteorological stations at land sites and six-to-eight buoy-mounted stations on the Great Lakes will be deployed during 1982-83.
3. Six solar radiation stations will be deployed during 1982-83.

Relevance:

Meteorological and solar radiation data are requested by scientific staff in carrying out their programs. Measurement of meteorological variables is vital to the understanding of many physical processes. To meet these requests, instrumentation and data abstraction support is provided on a continuing basis (i.e., 12-month period).

Work Outline:

Over the past years, Technical Operations has operated and provided meteorological instrumentation support both for common-user and dedicated programs by maintaining:

1. Meteorological data acquisition systems.
2. Solar radiation data acquisition systems.
3. Sensors, i.e., wind speed, wind direction, humidity, air temperature, water temperature.
4. Meteorological data abstraction and editing. All compiled data are provided at 10-minute and hourly averaged format for release to project leaders and archiving at NWRI.

STUDY TITLE	Limnological Instrumentation Support	DIV OR ORG T/OPS
KEY WORDS	Equipment, instrumentation	SEC'N OR GRP TOPDIV
STUDY LEADER	J.A. Diaz	TEL: 637-4691
TEAM MEMBERS	J.A. Tyler	PAE 1700
ECS PROGRAM	Water Management Research	DATE 82/01/27
ACTIV ELEM	General	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

1. To continue the ongoing maintenance, modification, calibration and upgrading of self-recording current meters, digitizers, electro-bathythermograph units, shipboard transmissivity measuring systems, rosette water sampling systems and all ancillary equipment associated with the above.
2. To update and improve functioning of the above equipment.
3. To supply serviceable field instrumentation systems as and when requested by scientific staff for their studies.

Requests by scientific staff to carry out their programs cover a vast range of old and newly developed complex and highly sophisticated electronic instruments. This equipment could be common-user or dedicated and quality of usable data depends on a high quality of calibration and maintenance. This relieves the scientists of equipment logistics, maintenance and calibration.

Maintain and provide support for the following classes of gear:

1. Current meters self-recording electronic
2. General self-recording field data loggers
3. CCE tower facility
4. Underwater acoustic release units
5. Field temperature profile systems
6. Electro-bathythermograph systems EBT
7. Transmissivity measuring systems
8. Ancillary equipment associated with the above systems

STUDY TITLE	Open House '82	DIV OR ORG T/OPS
KEY WORDS	Information, public	SEC'N OR GRP TOPDIV
STUDY LEADER	Macdonald, H.B. TEL: 637-4217	PAE 1700
TEAM MEMBERS	J.A. Diaz, P.M. Healey, M.R. Mawhinney, W.B. Taylor	DATE 82/01/27
ECS PROGRAM	Water Management Research	
ACTIV ELEM	General	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

To provide representative input to the CCIW Open House scheduled for April 1992.

Relevance:

Public information and relations.

Work Outline:

1. Develop displays in the T/OPS areas of responsibility.
2. Have representation on NWRI Open House Sub-Committee.
3. Assist on the Open House Core Committee.

STAFF SERVICES DIVISION

	SECTION	STUDY	STUDY TITLE	STUDY LEADER
*	BUILDING AND PROPERTIES	907	PHYSICAL PLANT	STEWART, D. F.
*	CENTRAL REGISTRY	905	ADMINISTRATION(CENTRAL REGISTRY)	RAE, E.
*	FINANCE	906	FINANCE	MITCHELL, A.
*	INFORMATION	908	PUBLIC INFORMATION	MACLEOD, I.
*	LIBRARY SERVICES	909	LIBRARY	DOWIE, E.
*	MATERIAL MANAGEMENT	904	ADMINISTRATION(MATERIEL MANAGEMENT)	HICKS, C.
*		901	ADMINISTRATION	SMITH, J. D.
*		902	ADMINISTRATION(DSS)	FINDLAY, J. B.
*		903	ADMINISTRATION(PERSONNEL UNIT)	NAMETH, S.

STUDY TITLE	ADMINISTRATION	DIV OR ORG SSD
KEY WORDS	PLAN, MANAGEMENT	SEC'N OR GRP SSDDIV
STUDY LEADER	SMITH, J.D. TEL: 637-4656	PAE 1905
TEAM MEMBERS	SMITH, S., BOYD, F., LEACOCK, C., ZROSTEK, H., AS-I Position (VACANT)	DATE 82/01/29
ECS PROGRAM	MANAGEMENT AND ADMINISTRATION	
ACTIV ELEM	ADMINISTRATION	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

1. To simplify, and whenever possible, automate administrative practices in NWRI, and ensure that these practices are uniform throughout the Institute and responsive to NWRI Personnel and higher authority.
2. Staff two AS-I (FTC) positions in order to provide Administrative Support on the basis of 1 Administrative Officer for two Divisions (Engineering Section regarded as a Division for this exercise).
3. Expand the duties, and with training, enhance the capabilities of Administrative Officers to improve the level of administrative support provided to Division Chiefs.
4. By directing the efforts of the Administrative team along a common path, enhance the Institute's ability to respond to HQ directives on matters which affect all Divisions (e.g. staffing, student employment, official languages matters, safety policy.)
5. By training, and the phased introduction of word processing equipment and new software packages, provide the Institute with automated office and information retrieval and enhanced word processing capabilities.
6. Devise and maintain an Institute Training Plan.

STUDY TITLE	ADMINISTRATION (DSS)	DIV OR ORG SSD
KEY WORDS	PROCUREMENT, CONTRACTS	SEC'N OR GRP SSD DIV
STUDY LEADER	FINDLAY, J.B. TEL: 637-4302	PAE 1905
TEAM MEMBERS	CEOLIN, J.	DATE 82/01/29
ECS PROGRAM	Management and Administration	
ACTIV ELEM	Administration	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

1. To provide low dollar value purchasing services for all government departments located at CCIW, ensuring that they are carried out in a cost effective manner in accordance with the Government of Canada Supply & Services Act.

STUDY TITLE	Administration (Personnel Unit.)	DIV OR ORG SSD
KEY WORDS	STAFFING, PERSONNEL, CLASSIFICATION	SEC'N OR GRP SSD DIV.
STUDY LEADER	NAMETH, S. TEL: 637-4591	PAE 1905
TEAM MEMBERS	Pettit, S.C.; Wydryk, B.J.; Mahaffy, D.; Hynan, J. St. Laurent, S.; Desjardins, L.A.; Onagen, D.	DATE 82/01/29
ECS PROGRAM	Management and Administration	
ACTIV ELEM	Administration	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

1. To provide staffing, classification, staff relations, pay and benefits, training and human resource planning services for all DOE components headquartered at CCIW.
2. Ensure that all aspects of legislation and associated departmental regulations, relative to employment in the Public Service are complied with.

STUDY TITLE	ADMINISTRATION (MATERIEL MANAGEMENT)	DIV OR ORG SSD
KEY WORDS	MATERIEL MANAGEMENT	SEC'N OR GRP MATRL
STUDY LEADER	HICKS, C. TEL: 637-4391	PAE 1905
TEAM MEMBERS	EADIE, M., MELLON, J., HICKS, S., COVENTRY, W., NILES, D. (Storeman - VACANT)	DATE 82/01/29
ECS PROGRAM	MANAGEMENT AND ADMINISTRATION	
ACTIV ELEM	ADMINISTRATION	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

1. To provide, on a continuing basis, the full scope of Materiel Management Services, i.e. Procurement, Inventory Control and Assets Management, Disposal, Warehousing and Stores, Shipping/Receiving, and Motor Vehicle maintenance and reporting. Services to be provided in a manner which will ensure optimum usage and benefits of all materiel resources available in CCIW for all units supported by the Materiel Management Section.
2. Introduce a centralized Materiel Management System through which all materiel used in NWRI and associated units, will be issued and received. System to include automatic replenishment.
3. Automate document procedures associated with procurement, issue and receipt of materiel.
4. Complete a total inventory of all materiel on hand, including furniture.
5. Update computerized Capital Assets Inventory to include location of major items.
6. Re-organize Materiel Management Section, separating Procurement from the Warehousing/Stores function with both sub-section heads reporting direct to the Chief, Staff Services Division.

STUDY TITLE	ADMINISTRATION (CENTRAL REGISTRY)	DIV OR ORG SSD
KEY WORDS	RECORDS MANAGEMENT	SEC'N OR GRP CR
STUDY LEADER	RAE, E. TEL: 637-4275	PAE 1905
TEAM MEMBERS	SOLVASON, M. (Part-time), SYMMS, J. (Part-time), FORAN, D., ROSS, M.C. (Term)	DATE 82/01/29
ECS PROGRAM	MANAGEMENT AND ADMINISTRATION	
ACTIV ELEM	ADMINISTRATION	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

1. To provide management of records, mail services, telex and telecopy services, and maintain duplicating facilities for departments located at CCIW. Services to be provided in an efficient, cost effective manner to ensure that scientific programs are not impeded by administrative delays.
2. Review Central Registry procedures and automate, wherever possible, all routine clerical functions.
3. Review CCIW duplicating/photocopying facilities to ensure that required services are provided in an efficient, cost effective manner.
4. Maintain accurate records on costs of Central Registry services provided to other Government departments and other DOE/ECS agencies in CCIW.

STUDY TITLE	FINANCE	DIV OR ORG SSD
KEY WORDS	BUDGETS, CAPITAL, FINANCE	SEC'N OR GRP FINS
STUDY LEADER	MITCHELL, A. TEL: 637-4681	PAE 1904
TEAM MEMBERS	Hyndiuk, A.; Hutton, Y.; Titley, B.; Jefferson, D. King, E.; Haswell, R.	DATE 82/01/29
ECS PROGRAM	Management and Administration	
ACTIV ELEM	Finance	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

1. Provide financial accounting and reporting services to all ECS units located at CCIW by maintaining records of allocations, expenditures and commitments, processing all accounts payable, travel, relocations and miscellaneous claims, receiving and issuing Receiver General pay cheques, maintaining a petty cash fund and making deposits to the Receiver General Transfer Account.
2. Review accounts payable and procurement procedures and automate, whenever possible, all routine clerical functions.
3. Complete an internal training program to ensure that Finance Clerks are interchangeable between all Finance office positions.
4. Complete a training program to ensure that all Finance Clerks are familiar with new AFMAS accounting system.
5. Write Finance section of Institute Administrative Procedures.

STUDY TITLE	PHYSICAL PLANT	DIV OR ORG SSD
KEY WORDS	PLANT	SEC'N OR GRP B/PROS
STUDY LEADER	STEWART, D.F. TEL: 637-4500	PAE 1906
TEAM MEMBERS	STEWART, J.C., SMIT, D.J., GRAY, R.J., PLATT, C.K., TAYLOR, K. McCURDY, R.J., ADAMS, F., ALLABY, A.K., CONNORS, M., CLEWLEY, D.C., DENOMME, J.P., JOHNSON, W.A., COMISKEY, T.	DATE 82/01/29
ECS PROGRAM	MANAGEMENT AND ADMINISTRATION	
ACTIV ELEM	PHYSICAL PLANT	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

1. To maintain CCIW buildings and plant, and progress the orderly development of the Centre, as necessary, to sustain CCIW research programs.
2. Produce a CCIW development & maintenance plan which includes estimates of maintenance and construction costs and building life cycle cost analysis data.
3. Review all B&PS clerical procedures and automate wherever possible.
4. Using word processing facilities, create and maintain a record of CCIW space allocations.
5. Using word processing facilities, create and maintain a record of CCIW telecommunications equipment.
6. Progress energy conservation endeavours.

NATIONAL WATER RESEARCH INSTITUTE

Study Plan

NO: 82- 908

STUDY TITLE	PUBLIC INFORMATION	DIV OR ORG SSD
KEY WORDS	INFORMATION, PUBLIC	SEC'N OR GRP INFOS
STUDY LEADER	MACLEOD, I.	TEL: 637-4260 PAE 1909
TEAM MEMBERS		DATE 82/01/29
ECS PROGRAM	MANAGEMENT & ADMINISTRATION	
ACTIV ELEM	PUBLIC INFORMATION	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

1. To provide the general public, outside agencies and environment specialist groups with information which fully explains the many and varied research activities at NWRI, from a Great Leakes and national perspective, in a manner which indicates the Federal presence in the community, and that maximum research activity is obtained at minimum cost.
2. Produce NWRI Annual Report for FY 81/82.
3. Expand NWRI slide library.
4. Ascertain costs and revise format for film "Second Frontier".
5. Support Open House activities.
6. Produce "Internal Waves" newsletter.
7. Monitor contract for Public Information Consultant.

STUDY TITLE	LIBRARY	DIV OR ORG SSD
KEY WORDS	LIBRARY, PLAN	SEC'N OR GRP LIBRAS
STUDY LEADER	DOWIE, E. TEL: 637-4530	PAE 1910
TEAM MEMBERS	BENNETT, P. (Part-time), GREEN, I. (Part-time), HALEY, P., FINCH, K., TINNEY, J.	DATE 82/01/29
ECS PROGRAM	MANAGEMENT & ADMINISTRATION	
ACTIV ELEM	LIBRARY	

GOALS FOLLOWED BY RELEVANCE AND WORK OUTLINE

1. To ensure that the library continues to respond to the changing needs of the research community, within the constraints of limited financial and PY resources.
2. Implement Phase I of an automated library system with first priority being given to cataloguing functions (DOBIS).
3. Review computer services & facilities for reference services.
4. Update microfiche/microfilm equipment.
5. Continue initiatives to eliminate cataloguing backlogs.
6. Enlist services of a serials agent.
7. Devise library disaster plan.
8. Update library training plan for FY 83/84 and 84/85.
9. Establish a core collection of journals maintained by the library.
10. Complete investigation of library security and hours of operation to achieve greater circulation control of library collection.
11. Devise book collection development policy.
12. Manage Contract for the preparation of IAGLR published materials.

